NOTICE:

"BEST AVAILABLE COPY"

PORTIONS OF THE FOLLOWING DOCUMENT ARE ILLEGIBLE

The Administrative Record Staff

NOTICE

All drawings located at the end of the document.

~~57777~~
57260

039520/P

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
SOLAR POND PROJECTS

ACCELERATED POND SLUDGE PROCESSING

FINAL CONCEPTUAL DESIGN REPORT

CONTRACT NO. 225471001/ST3

PREPARED FOR

EG&G ROCKY FLATS, INC.
GOLDEN, COLORADO

PREPARED BY

HALLIBURTON NUS CORPORATION
PITTSBURGH, PENNSYLVANIA

JUNE 7, 1995

Halliburton NUS
CORPORATION

039520/P

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
SOLAR POND PROJECTS

ACCELERATED POND SLUDGE PROCESSING

FINAL CONCEPTUAL DESIGN REPORT

CONTRACT NO. 225471001/ST3

PREPARED FOR

EG&G ROCKY FLATS, INC.
GOLDEN, COLORADO

PREPARED BY

HALLIBURTON NUS CORPORATION
PITTSBURGH, PENNSYLVANIA

JUNE 7, 1995

SUBMITTED BY:

RICHARD M. NINESTEEL, P.E.
PROJECT MANAGER

APPROVED BY:

DONALD R. BRENNEMAN
VICE PRESIDENT
CORPORATE SPONSOR

CONCEPTUAL DESIGN REPORT REVISIONS

Revision	Description	Issue Date	Project Engineer	User Mgr.	P.E. Mgr.

The above operating contractor signatures indicate agreement that the equipment and/or facilities described herein fully meet the using department's requirements.

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

TABLE OF CONTENTS

PART 0	SUMMARY
PART I	DESIGN CONCEPT
PART II	PROJECT MANAGEMENT
PART III	SUPPLEMENTAL INFORMATION

039520/P

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
SOLAR POND PROJECTS

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

PART 0 - SUMMARY

CONTRACT NO. 225471001/ST3

PREPARED FOR

EG&G ROCKY FLATS, INC.
GOLDEN, COLORADO

PREPARED BY

HALLIBURTON NUS CORPORATION
PITTSBURGH, PENNSYLVANIA

JUNE 7, 1995

SUMMARY

Halliburton NUS was contracted by EG&G Rocky Flats to generate a conceptual design to minimally treat sludges from the 207 Solar Evaporation Ponds and Building 788 Clarifier (presently stored in interim storage tanks) to satisfy the Waste Acceptance Criteria (WAC) for placement in the Operable Unit 4 (OU4) closure area. The WAC required that the treated waste:

- Have no free liquids.
- Not exceed 3 inches in size if in particulate form.
- Be resistant to wind dispersion.
- Be protective of human health and the environment.
- Contain no pathogenic or gas-producing micro-organisms.

The Pond Sludge Treatment System presented in this Conceptual Design Report is designed to satisfy the WAC requirements in a safe, reliable and cost-effective manner. The treatment system is made up of the following operations:

- Transfer of sludges from the interim storage tanks.
- Sludge feed to the treatment process.
- Treatment additives storage and feed.
- Sludge mixing/blending treatment with additives.
- Treated waste screening and recycling of undersized particulates.
- Treated waste staging and testing.
- Treated waste transfer to OU4 closure area.
- Dust emissions control.

The additives used in the treatment process are hydrated lime, which is used as a biocide and for moisture control, and cement and fly ash for their pozzolanic properties. The treated waste that is formed is a relatively dry friable product that is free of fine particulates.

The project schedule estimates that the Pond Sludge Treatment System will be operated for 7 months; an additional 3-month schedule reserve is provided. It is estimated that the treatment system will have the following costs: Capital ($3,100,000); Operations and Maintenance ($5,600,000); and Decontamination and Dismantling ($350,000).

039520/P

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
SOLAR POND PROJECTS

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

PART I - DESIGN CONCEPT

CONTRACT NO. 225471001/ST3

PREPARED FOR

EG&G ROCKY FLATS, INC.
GOLDEN, COLORADO

PREPARED BY

HALLIBURTON NUS CORPORATION
PITTSBURGH, PENNSYLVANIA

JUNE 7, 1995

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

PART I - DESIGN CONCEPT
TABLE OF CONTENTS

SECTION			PAGE
1.0	**INTRODUCTION**		**1-1**
2.0	**REGULATORY REQUIREMENTS**		**2-1**
	2.1	REGULATORY COMPLIANCE STRATEGY	2-1
	2.2	OTHER COMPLIANCE REQUIREMENTS	2-2
	2.3	ENVIRONMENTAL REGULATORY CRITERIA	2-3
	2.4	HEALTH AND SAFETY CRITERIA	2-3
3.0	**DESIGN CRITERIA**		**3-1**
	3.1	WASTE ACCEPTANCE CRITERIA	3-1
	3.2	POND SLUDGE CHARACTERISTICS	3-2
	3.2.1	Ponds 207A, 207B-Series and 788 Clarifier	3-2
	3.2.2	Pond 207C	3-2
	3.3	OPERATING PARAMETERS	3-3
4.0	**APPLICABLE CODES, STANDARDS, AND REFERENCES**		**4-1**
5.0	**GENERAL DESCRIPTION**		**5-1**
	5.1	INTRODUCTION	5-1
	5.2	POND SLUDGE TRANSFER	5-2
	5.3	POND SLUDGE FEED	5-2
	5.4	TREATMENT ADDITIVES STORAGE AND FEED	5-3
	5.5	POND SLUDGE MIXING/BLENDING TREATMENT	5-4
	5.6	TREATED WASTE SCREENING AND RECYCLING OF UNDERSIZED TREATED WASTE	5-4
	5.7	TREATED WASTE STORAGE AND TESTING	5-5
	5.8	TREATED WASTE TRANSFER TO OU4 CLOSURE AREA	5-5
	5.9	DUST EMISSIONS CONTROL	5-6
6.0	**DESIGN CONCEPT**		**6-1**
	6.1	HEALTH AND SAFETY	6-1
	6.2	PROCESS DESIGN	6-3
	6.2.1	Units Description and Normal Operation	6-3
	6.2.1.1	Area 1000: Sludge Removal and Transfer Unit	6-3
	6.2.1.2	Area 2000: Sludge Feed Unit	6-7
	6.2.1.3	Area 3000: Treatment Additives Storage and Feed Units	6-10
	6.2.1.4	Area 4000: Mixing/Blending Treatment Unit	6-14
	6.2.1.5	Area 5000: Treated Waste Storage and Transport Unit	6-18
	6.2.1.6	Area 6000: Treated Waste Recycle Unit	6-19

PART I - DESIGN CONCEPT
TABLE OF CONTENTS (Continued)

SECTION		PAGE
6.2.2	Mechanical Check-Out and Initial System Operation	6-22
6.2.3	Normal Daily/Short-Term System Start-Up and Shut-Down	6-23
6.2.3.1	Pond Sludge Removal and Transfer	6-23
6.2.3.2	Pond Sludge Feed and Treatment	6-24
6.2.4	Long-Term System Shut-Down/Decommissioning	6-26
6.2.5	Emergency System Shut-Down	6-27
6.2.6	Process Trouble Shooting	6-27
6.3	MECHANICAL DESIGN	6-27
6.3.1	Introduction	6-27
6.3.1.1	Area 1000: Sludge Removal and Transfer Unit	6-30
6.3.1.2	Area 2000: Sludge Feed Unit	6-31
6.3.1.3	Area 3000: Treatment Additive Storage and Feed Units	6-34
6.3.1.4	Area 4000: Mixing/Blending Treatment Unit	6-35
6.3.1.5	Area 5000: Treated Waste Storage and Transport Unit	6-39
6.3.1.6	Area 6000: Treated Waste Recycle System	6-40
6.4	ELECTRICAL DESIGN	6-41
6.5	CIVIL/STRUCTURAL DESIGN	6-42
7.0	**OTHER CONSIDERATIONS**	7-1
7.1	UTILITY REQUIREMENTS	7-1
7.2	QUALITY ASSURANCE	7-1
7.3	SECURITY	7-1
8.0	**PROJECT EXECUTION**	**8-1**
9.0	**COST ESTIMATE**	**9-1**

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

PART I - DESIGN CONCEPT
TABLE OF CONTENTS

TABLES

NUMBER		PAGE
3-1	Treatment System Operating Parameters	3-4
6-1	Process Trouble Shooting, Pond Sludge Treatment System	6-28
8-1	Project Schedule	8-2

1.0 INTRODUCTION

Operable Unit 4 (OU4), the Solar Ponds, is an element of the United States Department of Energy's (USDOE) Environmental Restoration Program at the Rocky Flats Environmental Technology Site (RFETS). OU4 includes five solar evaporation ponds: 207A, 207B series (north, center and south), and 207C. Starting in the late 1950s the ponds were used to store and evaporate low-level radioactive process water.

The sludges have been removed from the five Solar Evaporation Ponds [207A, 207B series (north, center, and south), and 207C] and the Building 788 Clarifier and are being stored on an interim basis in 78 tanks on the 750 Pad. Each of the interim storage tanks has a nominal 10,000 gallon (gal.) capacity.

Sludges from the Solar Evaporation Ponds 207A and 207B are a combination of liquid and solids, and the total stored volume is approximately 220,000 gal. Sludges from Solar Evaporation Pond 207C are a combination of liquids, solids, and salts, and the total volume stored is approximately 540,000 gal. Sludges from the Building 788 Clarifier have a total volume of approximately 20,000 gal. The hazardous waste codes associated with the wastes from the ponds and clarifier are: F001, F002, F003, F005, F006, F007, F009 and D006.

As part of the closure plans for OU4, these sludges are to be treated to satisfy specific Waste Acceptance Criteria (WAC) and then placed in the OU4 closure area and covered with a cap.

This Conceptual Design Report (CDR) has been generated by Halliburton NUS (HNUS) to satisfy the requirements of the Statement of Work (SOW) entitled "Accelerated Sludge Processing Conceptual Design, Sludge and Pondcrete Processing" (Revision 3), dated October 27, 1994. This SOW replaced the SOW entitled "Accelerated Sludge Processing Conceptual Design" (Revision 1), dated August 3, 1994. This CDR expands upon the White Paper generated by HNUS in August 1994 to satisfy the requirements of the August SOW, and Revision 1 of the White Paper which was generated by HNUS in December 1994 to satisfy the requirements of the SOW, Revision 3, dated October 1994.

The SOW, Revision 3, specifies that a conceptual design be developed to minimally treat sludges from the five Solar Evaporation Ponds and Building 788 Clarifier, presently stored in tanks on the 750 Pad, to an acceptable standard that will allow placement under the OU4 cap. This CDR provides in detail the design and engineering bases for the pond sludge treatment system, and is in sufficient form and content to

support the requirements of a Title II definitive design package. It has been generated in accordance with applicable Rocky Flats Conduct of Engineering Manuals (COEM).

2.0 REGULATORY REQUIREMENTS

The RFETS is undergoing a phased program of permitting under the Resource Conservation and Recovery Act (RCRA). The facility is applying for permitted status for various hazardous waste units in accordance with prioritization and a schedule negotiated with the Colorado Department of Public Health and the Environment (CDPHE). Accordingly, RFETS operates under both interim and final (permitted) status. The Solar Evaporation Ponds 207A, 207B, and 207C and the 788 Clarifier form three interim status units (The 788 Clarifier and 207C Pond are each separate units; the 207A and B Ponds are combined to form one unit). Pad 750, which presently supports the tents that house the sludge storage tanks and the proposed sludge treatment equipment, is also an interim status unit. Both units are to be closed under interim status.

2.1 REGULATORY COMPLIANCE STRATEGY

To facilitate the timely processing and disposal of the treated pond sludge within OU4, the remedial design proposes to take advantage of modifications to 40 CFR Parts 264 and 265 promulgated by the U.S. Environmental Protection Agency (USEPA) on February 16, 1993, and the Colorado analog in 6 CCR 1007-3 promulgated on May 31, 1994. These rules allow for the creation of Corrective Action Management Units (CAMUs) and Temporary Units (TUs). These units "function solely to manage wastes that are generated at a RCRA facility for the purpose of implementing remedial actions required at that facility"... (FR Vol. 58, No. 29, p. 8659). Among other provisions, the rulemaking allows remediation wastes to be consolidated or processed on site without triggering Land Disposal Restrictions (LDRs) or Minimum Technology Requirements (MTRs) which were promulgated to control hazardous waste production from ongoing manufacturing activities. The requirements for the application of CAMUs and TUs are presented in 40 CFR 264 Subpart S, which addresses RCRA-permitted facilities. These requirements are incorporated by reference in 40 CFR 265.1(b) which addresses interim status facilities and which applies to the closure of the Solar Ponds. Colorado's rules substantively incorporate the intent and scope of the Federal rules with certain modifications which address the harmonizing of the CAMU and TU requirements with Colorado's existing hazardous waste rules, and which clarify ambiguities in the Federal rules. Pending final evaluation and CDPHE approval, alternative compliances proposed under Subpart S could also be proposed under Subpart X, and the units could alternately be permitted under Subpart X.

Therefore, the following regulatory assumptions are made for design purposes:

- The treatment system to be located in Tent 12 on 750 Pad will be a TU. (It is assumed that a CDPHE permit will be issued for this TU).

- The Solar Ponds will form a CAMU and will serve as the disposal site for the sludges which have been removed from the ponds and are in storage on 750 Pad, as well as the disposal site for contaminated soils from an adjacent area located outside the boundaries proposed for the CAMU.

In general, hazardous waste treatment units require secondary containment, with exemptions applied to certain types of facilities. The TU rule does not specifically address secondary containment requirements, leaving the determination of the applicable standards to Colorado. It is possible that the treatment system would be entitled to the exemptions provided in the regulations, even if there was no latitude provided in the application of standards. However, for purposes of this design, the following assumptions are made:

- The processing equipment will be provided with secondary containment.

- The sludge feed equipment will be emptied prior to weekends, holidays, or extended downtime. Sludge will be processed until none remains, or leftover sludge will be returned to the interim storage tanks from which it was collected.

- Secondary containment provisions will not be applied to treatment additive(s) since these materials are relatively immobile, and will be carefully contained. Similarly, secondary containment provisions will not be applied to the treated waste.

2.2 OTHER COMPLIANCE REQUIREMENTS

Certain emissions and exposure restrictions apply to USDOE facilities which engage in the management of materials containing radionuclides. With respect to emissions, the National Emissions Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities apply (40 CFR 61.96). These standards specify limits for radionuclide levels in ambient air. In view of the low level of radioactivity associated with the sludges, an emissions impact and/or a significant air permitting effort are not anticipated to be necessary for this design. This matter will be reviewed with the RFETS air quality specialists during the preparation of the Title II design and air permitting or monitoring requirements will be specified accordingly.

Applicable occupational exposure limits are addressed in USDOE Order 5480.11. These limits consider the exposures that may occur from all pathways, and relate to worker protection.

USDOE Order 5400.5 requires USDOE facilities and their contractors to implement As Low As Reasonably Achievable (ALARA) controls to emissions and discharges containing radionuclides. ALARA is a discretionary level of control that goes beyond regulatory requirements. For the purposes of this design, ALARA is applied to the control of dust emissions by covering potential sources and maintaining negative air pressure at those sources, and by applying High Efficiency Particulate Air (HEPA) Filters to all vents and exhausts from potential dust sources.

Since no liquid discharges are anticipated from the proposed treatment facility, no standards related to discharges will apply.

2.3 ENVIRONMENTAL REGULATORY CRITERIA

The following environmental regulatory criteria apply:

- TUs can operate for no more than one year. Therefore, the sludges must be completely processed within this period. The treatment system could also be permitted under Subpart X. If Subpart X is used, the sludge must be processed within the time the closure excavation is available, which is also expected to be about one year.

- Transfer of materials between the tents by conveyors, transfer lines, or by means other than vehicles will require the use of secondary containment.

- Closure of the interim storage tanks is beyond the scope of this project.

2.4 HEALTH AND SAFETY CRITERIA

The following health and safety related criteria apply:

- A Health and Safety Plan (HASP), prepared in accordance with the Accelerated Sludge Removal Project (ASRP) Health and Safety Plan, will be required prior to any processing or placement of remediation wastes. The HASP will address medical monitoring requirements, industrial hygiene monitoring for caustic chemicals (e.g., CaOH), heavy metals (e.g., CuO_2) and radiological monitoring.

- Operational guidance described in the HASP will be observed by the operators.

- Personal Protective Equipment will be worn by operators in accordance with the HASP and the Radiation Work Permit (RWP).

- All operators will be provided with 40 hour hazardous materials training in accordance with 29 CFR 1910.120 prior to engaging in remediation activities.

- All operators will be provided with instruction in accordance with the Federal Hazard Communication Standard (29 CFR 1910.1200) prior to engaging in remediation activities.

- All operations personnel shall have adequate radiation worker training prior to engaging in remediation activities.

All operations will be conducted in accordance with the USDOE Radiation Control Manual and the RFETS radiation protection requirements. This CDR assumes that all Health & Safety monitoring required by the HASP will be performed by RFETS.

3.0 DESIGN CRITERIA

General design and operational criteria for the pond sludge treatment system are summarized in the following sections. Additional design and operational criteria are presented in the Design Concept Section 6.0.

3.1 WASTE ACCEPTANCE CRITERIA

The revised WAC, which the treated waste must satisfy before it can be placed in the OU4 closure area, were presented to HNUS by EG&G Rocky Flats on November 3, 1994. The provisions in the WAC that specifically impact design considerations for the pond sludge treatment system include:

- The treated waste shall have no free liquids as verified by the Paint Filter Liquid Test (SW 9095).
- If the treated waste is in a monolithic form, the following apply:
  - Each monolith shall not exceed 12 in. x 24 in. x 48 in. in size, and shall not be reinforced.
  - Compressive strength shall not exceed 3000 pounds per square inch (psi); shear and tensile strengths shall not exceed those of 3000 psi strength non-reinforced concrete.
  - Non-returnable monolith molds, containers or packaging shall not be used.
- If the treated waste is in particulate form, all particles in the treated waste shall pass through a 3-in. mesh screen, and shall not agglomerate after treatment unless the agglomeration satisfies the requirements specified for monoliths.
- The treated waste shall not cause an exceedence of the particulate or monolith requirements when blended with site soils in the closure area.
- The treated waste shall be resistant to wind dispersion.
- Storage of the treated waste at the OU4 closure area shall be minimized.

- The treated waste shall not be less protective of human health and the environment than the other materials selected for placement in the closure area.

- Pathogens, if present, shall be rendered innocuous.

- Any gas production from the treated waste shall be no greater than that generated by natural site soil.

3.2 POND SLUDGE CHARACTERISTICS

3.2.1 Ponds 207A, 207B-Series and 788 Clarifier

Based on the results of pond sludge characterization studies, the following design assumptions are made regarding the sludges from Pond 207A, Pond 207B, and the 788 Clarifier:

- The interim storage tanks are filled with sludge to a depth of 9 to 10 feet (ft). Each tank could contain approximately 9,000 to 10,000 gal. As a basis for design, a volume of 10,000 gal. per tank has been assumed.

- The sludge, which consists of settled solids and a liquid phase, occupies approximately 90 percent of the tank volume. Some free water was decanted off of the settled sludges in the tanks during storage to reduce the volume in storage.

- The settled sludge, based on previous characterization studies (HNUS Deliverable 224A and 224E, March 1992), are expected to contain approximately 15 percent solids (by weight) and have a high viscosity (500-1000 centipoise).

- The free liquid phase which covers the settled sludge contains some dissolved salts [less than 16,000 milligrams per liter (mg/l)], but has physical properties similar to water.

3.2.2 Pond 207C

The waste from Pond 207C is different from that stored in the Ponds 207 A and B due to the nature and source of the original wastes deposited for evaporation. Previous sampling and analysis efforts have shown that the waste from Pond 207C consisted of three general layers of material, as follows:

- A liquid phase which was a saturated or near-saturated brine, with sodium and potassium the predominant cations, and nitrate, chloride, and sulfate the predominant anions. Significant concentrations of heavy metals were also present. The brine layer in Pond 207C was stratified with lower Total Dissolved Solids (TDS) and specific gravity values near the pond surface, and higher TDS and specific gravity values at depth. The salinity of the brine layer was also a function of precipitation, evaporation, and temperature. The TDS of the brine layer ranged from 5.8 to 42.9 percent, by weight, based on data collected from the waste characterization study, the treatability studies, and a special sampling effort to characterize the degree of stratification of the brine. Specific gravity data ranged from 1.042 to 1.376. Observations from the stabilization treatability study showed that the samples of Pond 207C brine were saturated at approximately 35-40% TDS at room temperature (65-70°F).

- A precipitated/crystallized salt layer between the underlying silt and overlying brine layers. The thickness of this layer varied in response to basic physical and chemical parameters that affect salt crystal solubility, such as temperature and brine salt concentration.

- A solids layer made up of fine-grained material with a biologically degradable organic component as evidenced by gas generation and septic odor. It is estimated that up to 15 percent, by volume, of the pond wastes consists of this material.

The composition of the Pond 207C material in each storage tank will be a function of the degree of mixing of the brine, crystallized salt, and solids during removal from the pond and placement into the tank. While the contents of each storage tank will no longer be affected by precipitation or evaporation, the amount of salt in solution or in crystalline form could change due to normal temperature fluctuations. The mixture of 207C pond material as placed in the storage tanks is limited to a specific gravity no greater than 1.7 based on an agreement with CDPHE.

3.3 OPERATING PARAMETERS

The daily operating schedule for the sludge treatment facility is a function of:

- The total volume of sludge requiring treatment.
- The available time period for operating (i.e., preferred operating period of 7 months).
- The requirements of the treatment mix formulation.
- The logistics of materials handling (e.g., pond sludge, treatment additives, and treated waste).
- Delays or operating interruptions from outside sources.

Based on the information presented in previous sections regarding the volume and characteristics of the sludges to be treated, it is estimated the following operating rates will be required to satisfy the preferred 7-month operating schedule (see Table 3-1).

TABLE 3-1

TREATMENT SYSTEM OPERATING PARAMETERS

	C Pond	A/B Pond	Clarifier	Total
Total Sludge Volume (gal.)	540,000	220,000	20,000	780,000
Total Sludge Volume (yd^3)	2,674	1,089	99	3,862
Operating Days*	108	44	4	156

* Based on an average daily operating rate of 3,862 yd^3/156 days = approximately 25 yd^3/day

4.0 APPLICABLE CODES, STANDARDS, AND REFERENCES

The following is a list of additional national codes and standards, DOE Orders, RFETS procedures, and reference documents to be considered during the design of the Pond Sludge Treatment System. Particular standards and testing requirements will be identified in specific construction specifications during Title II design. The latest edition of each of the following documents will be used in the design, unless noted.

- American Concrete Institute (ACI)
- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- American Society for Testing and Materials (ASTM)
- COEM - PMG - 307, Rev. 0; Operational Requirements Document
- COEM - DES - 223, Rev. 1; Classification of Systems Components and Parts
- COEM - DES - 231, Rev. 1; Design Calculations
- COEM - DES - 243, Rev. 1; Preparation of Design Criteria
- COEM - AMN - 105, Rev. 1; Engineering Drawing Control
- COEM - AMN -121, Rev. 0; Rocky Flats Plant Standards
- DOE/EH - 0256T, Radiological Control Manual
- DOE Order 4700.1; Project Management System
- DOE Order 5400.1; General Environmental Protection Program
- DOE Order 5400.3; Hazardous and Radioactive Mixed Waste Program

- DOE Order 5400.5; Radiation Protection of the Public and the Environment
- DOE Order 5480.4; Environmental Protection Safety and Health Protection Standards
- DOE Order 5480.11; Radiation Protection for Occupational Workers
- DOE Order 5700.6C; Quality Assurance
- DOE Order 5820.2A; Radioactive Waste Management
- DOE Order 6430.1A; General Design Criteria
- DOE, Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards, DOE 1020-94.
- RFETS Health and Safety Practices Manual
- National Electrical Code (NEC)
- National Safety Code (NESC)
- State of Colorado Hazardous Waste Regulations, 6 CCR 1007-6, Part 265
- Uniform Building Code

5.0 GENERAL DESCRIPTION

5.1 INTRODUCTION

The waste sludge from the RFETS Solar Evaporation Ponds 207A, 207B, 207C and the 788 Clarifier, hereafter referred to as pond sludge, is currently in interim storage in seventy-eight 10,000-gal, double-contained, high-density polyethylene tanks located in tents on the 750 Pad. Fifty-four tanks store C Pond sludge, twenty-two tanks store A/B Pond sludge, and two tanks store 788 Clarifier sludge.

The objective of the Pond Sludge Treatment System is to convert the pond sludge into a friable treated waste which satisfies the WAC for the "Contaminated Media" layer of the OU4 Interim Remedial Action (IRA) closure area (see Section 3). "Friable" means dry to the touch and easily crumbled.

For this purpose, the pond sludge is transferred from the interim storage tanks and blended with pozzolanic agents such as Portland cement, fly ash, and lime to adsorb free moisture, produce a friable treated waste, and destroy any pathogens and gas-producing micro-organisms.

To minimize dust emissions, the treated waste is screened and any undersized material is immediately recycled back to treatment for re-processing. The screened treated waste is staged in covered containers on the 750 Pad while tests are conducted to confirm compliance with the WAC. Upon satisfying the WAC requirements, the treated waste is transported to the OU4 closure area for distribution and placement by the closure work area contractor.

The Pond Sludge Treatment System consists of the following process operations:

- Pond sludge transfer from interim storage tanks.
- Pond sludge blending, short-term storage and feed to treatment.
- Treatment additives storage and feed.
- Pond sludge mixing/blending treatment with additives.
- Treated waste screening and recycling of undersized treated waste.
- Treated waste storage and testing.
- Treated waste transfer to OU4 closure area.
- Dust emissions control.

The purpose of this section is to provide a general description of these process operations and to identify key process design parameters [refer to the General Arrangement Plans and Sections (Drawings 51309-CX02 and C201 through C203), and Process Flow Diagrams (Drawings 51309-C001 and C002) in Part III-Appendix A].

5.2 POND SLUDGE TRANSFER

The purpose of the Pond Sludge Transfer process operation is to bring the pond sludge from the interim storage tanks to the Pond Sludge Feed process operation at a controlled rate.

The pond sludge is transferred from the interim storage tanks to the feed tanks in a batch fashion with a system combining a vacuum pump, which provides the suction required to remove the pond sludge out of interim storage tanks, with a progressive-cavity pump which transfers the removed pond sludge to the feed tanks. As required, process water is also used to slurry the pond sludge out of the interim storage tanks.

The pond sludge is removed from the interim storage tanks in batches of 2,500 gal at an average design flow rate of 30 gallons per minute (gpm). Under average design conditions, two 2,500-gal batches of pond sludge are removed from the interim storage tanks each operating day.

5.3 POND SLUDGE FEED

The purpose of the Pond Sludge Feed process operation is to blend each batch of pond sludge removed from the interim storage tanks and to feed the blended pond sludge at a controlled rate to the Mixing/Blending Treatment process operation.

Each batch of pond sludge removed from the interim storage tanks is blended and temporarily stored in cone-bottom feed tanks. These tanks are also used to decant any process water as may be used for removal of the pond sludge from the interim storage tanks and restore the pond sludge to its original solids concentration. The pond sludge is then fed at a controlled rate from the bottom of the feed tanks to the Mixing/Blending Treatment Unit process operation by progressive-cavity pumps.

There are two feed tanks operating in a fill-and-draw batch mode with, at any given time, one feed tank being filled from the interim storage tanks while the other is being emptied to the Mixing/Blending Treatment process operation. The process water decanted in the feed tanks is collected in the Process Water Tank and either recycled to the interim storage tanks to assist the pond sludge removal process or distributed as flushing water throughout the treatment system by centrifugal pumps. There will probably be a net

surplus of water from the removal and transfer of the A/B Pond sludge. This water does not need to be included in the subsequent pond sludge mixing and treatment process unit operation. The surplus water will be stored in the Process Water Tank or emptied interim storage tanks and periodically trucked to Building 374 for treatment or used as flush and/or dilution water during C Pond sludge treatment operations.

Pond sludge is fed to the Mixing/Blending Treatment process operation in 1,250-gal batches at a controlled average design flow rate of 16.7 gpm which corresponds to about 5 cubic yards per hour of A/B Pond sludge (and 788 Clarifier sludge) or C Pond sludge. Under average design conditions, four 1,250-gal. batches of pond sludge are fed each operating day to the Mixing/Blending Treatment process operation.

5.4 TREATMENT ADDITIVES STORAGE AND FEED

The purpose of the Treatment Additives Storage and Feed process operation is to ensure on-site availability of adequate quantities of the required treatment additives, including pozzolans (Portland cement, fly ash) and hydrated lime, and to feed these additives in a controlled fashion to the Mixing/Blending Treatment process operation.

Treatment additives are stored in bulk storage silos and fed to the Mixing/Blending Treatment process operation by a combination of rotary valve feeder, weigh-belt conveyor, and screw conveyor.

The rate of addition of pozzolans is based on the results of treatability testing which determined that average water-to-pozzolans ratios of 0.18 and 0.23 (by weight) are required for the C Pond sludge and A/B Pond sludge, respectively. Within the pozzolans, the weight-to-weight ratio of fly ash to Portland cement is 2:1. A slight excess (5 to 10 percent) of pozzolans is normally fed to insure maximum treated waste dryness. The average design weight/volume quantity of pozzolans added to each 1,250-gal batch of pond sludge ranges from 18.6 tons/23.2 cubic yards (yd^3) for C Pond sludge to 22.0 tons/27.4 yd^3 for A/B Pond sludge. Design pozzolans feed rate ranges from 14.9 ton/hr (tph) for C Pond sludge to 17.6 tph for A/B Pond sludge. Average daily design usage of pozzolans ranges from 74.5 tons for treatment of C Pond sludge to 88 tons for treatment of A/B Pond sludge. (See Part III - Appendix C, Design Basis Data, for further information on additive feed ratios, etc.)

The rate of addition of hydrated lime is based on 150 pounds (lbs.) of lime per ton of pond sludge. The average design weight/volume quantity of hydrated lime added to each 1,250-gal batch of pond sludge ranges from 0.42 tons/0.50 yd^3 for A/B Pond sludge to 0.60 tons/0.69 yd^3 for C Pond sludge. Design feed rate of hydrated lime ranges from 0.34 tph for A/B Pond sludge to 0.48 tph for C Pond sludge. Average

daily design usage of hydrated lime ranges from 1.7 tons for treatment of A/B Pond sludge to 2.4 tons for treatment of C Pond sludge.

5.5 POND SLUDGE MIXING/BLENDING TREATMENT

The purpose of the Mixing/Blending Treatment process operation is to convert the pond sludge into a friable treated waste meeting the WAC for placement in the OU4 closure area.

Each 1,250-gal. batch of pond sludge is treated by mixing and blending it with controlled quantities of the treatment additives in a pug mill to produce a corresponding batch of treated waste.

The average design weight/volume of each batch of treated waste produced by the Mixing/Blending Treatment process operation ranges from 28.1 tons/21.2 yd^3 for C Pond sludge to 27.2 tons/20.3 yd^3 for A/B Pond sludge. The average design processing time is 75 minutes per batch and an average of four batches of treated waste are produced for each operating day.

5.6 TREATED WASTE SCREENING AND RECYCLING OF UNDERSIZED TREATED WASTE

The purpose of the Treated Waste Screening process operation is to remove fine particles from the treated waste so as to minimize dust emissions upon handling and placement of that treated waste. These fine particles mostly result from the previously-mentioned use of a slight excess of pozzolans to insure adequate dryness of the treated waste. The screened-off fine particles, which consist mostly of excess pozzolans, are recycled to the Mixing/Blending Treatment process operation.

Particles smaller than 2 millimeters (mm) are removed from the treated waste by a vibrating screen. Screened treated waste is transferred to one of the roll-off containers of the Treated Waste Storage and Testing process operation by a belt conveyor. A motorized jockey system is provided to allow for even distribution of the screened treated waste within the roll-off container. The undersized treated waste fines are collected in a screw conveyor and recycled to the Mixing/Blending process operation by the wet/dry vacuum system of the Treated Waste Recycle process operation.

The average design weight/volume quantities of screened treated waste and undersized material produced by the screening of each batch of C Pond sludge treated waste are 27.1 tons/20.2 yd^3 and 1.2 ton/1.4 yd^3, respectively. The average design weight/volume quantities of screened treated waste and undersized material produced by the screening of each batch of A/B Pond sludge treated waste are 28.1 tons/22.1 yd^3 and 1.2 ton/1.4 yd^3, respectively.

5.7 TREATED WASTE STORAGE AND TESTING

The purpose of the Treated Waste Storage and Testing process operation is to provide sufficient curing time for the treatment additives to react with the pond sludge and form a treated waste which meets the WAC for placement in the OU4 closure area. The purpose of the Treated Waste Storage and Testing process operation is also to perform the necessary tests to verify that the treated waste does meet the WAC. If testing reveals that the treated waste fails to meet the WAC, the Treated Waste Storage and Testing process operation also provides for the recycling of the off-specification treated waste back to the Mixing/Blending Treatment process operation for re-processing.

The treated waste is stored in roll-off type containers equipped with removable top covers. Field testing of the cured treated waste includes performance of a Paint Filter Liquids Test (SW 9095) and pH measurement on a grab sample collected from each batch. Recycle of off-specification treated waste to the Mixing/Blending Treatment process operation is accomplished with a wet/dry vacuum system which combines a vacuum pump to aspirate the waste out of the roll-off container with a screw conveyor to transport the aspirated waste to the pug mill of the Mixing/Blending Treatment process operation.

Each batch of screened treated waste is stored and cured in a separate roll-off container for a period of one day. The Treated Waste Storage and Testing process operation provides for a total of twelve such containers. The off-specification treated waste recycle system has a design capacity of about 500 pounds per hour.

5.8 TREATED WASTE TRANSFER TO OU4 CLOSURE AREA

The purpose of the Treated Waste Transfer process operation is to transport the cured and tested treated waste from the storage/staging area to the OU4 closure area for subsequent placement under the cap by the closure contractor.

The cured treated waste is transferred to the OU4 closure area by truck in the same closed-top roll-off containers as used for the Treated Waste Storage and Testing process operation. The empty roll-off containers are returned to the Treated Waste Storage and Testing process operation for reuse.

The average design rate of transfer of cured treated waste to the OU4 closure area is four roll-off containers per operating day for a daily total weight/volume quantity of 108.7 tons/81.2 yd^3 of C Pond sludge treated waste or 112.4 tons/88.5 yd^3 of A/B Pond sludge treated waste.

5.9 DUST EMISSIONS CONTROL

The purpose of the Dust Emissions Control process operation is to prevent dispersion of the dust generated by the operation of the Pond Sludge Treatment System. The Dust Emissions Control process operation collects contaminated air streams at each dust emission point source, removes the particulates from the air streams, and recycles the removed particulates to the Mixing/Blending Treatment process operation.

The Dust Emissions Control process operation includes air collection manifolds, air transfer ductwork, bag house-type dust collector, centrifugal-type exhaust blower, and a HEPA exhaust filter. The dust collected in the baghouse is periodically discharged into a hopper and recycled from there to the pug mill of the Blending/Mixing Treatment process operation by the same system as used for the recycling of the off-specification treated waste.

6.0 DESIGN CONCEPT

6.1 HEALTH AND SAFETY

The Pond Sludge Treatment System will be designed to minimize personal exposure to hazardous materials, through application of ALARA principles. The process equipment selected is intended to be sufficiently protective of human health and the environment so that Personal Protective Equipment (PPE) requirements will be absolutely minimal. The procedures required to support process operations are intended to minimize the hazards associated with handling the raw and treated wastes. These objectives will be accomplished through the following design measures and methods:

- The end of the sludge transfer hose that is at an interim storage tank will be secured by a clamp on the Man-Lift, which will be provided for the operators. The hose will be connected to a suction wand which the operators will use to empty the tank. The wand will be valved, so the operators can interrupt flow to the sludge Discharge Hopper at any time.

- A collapsible, impermeable sleeve will be attached to the hose above the highest possible point of immersion in the interim storage tanks. When a tank has been emptied, any loose material clinging to the exterior of the hose will be rinsed off by a water spray. As the hose is withdrawn, the sleeve will be pulled over it to isolate the hose from the operators. When the hose is fully withdrawn, the end of the wand will be blanked off or bagged, and the sleeve will be tied shut. The hose and wand can then be moved safely to the next tank.

- As an option, facilities for more rigorous decontamination of the vacuum hoses, such as a wash station, can be provided.

- The sludge will be transferred from the interim storage tanks to the Discharge Hopper by vacuum, and will not be under pressure. Accordingly, there is minimal risk of materials release in the event of a system component failure.

- The hose disconnect at the Discharge Hopper will be within a casing that will provide containment for release of hose residuals during disconnecting. The casing will be supplied with

a latching cover. The Discharge Hopper skid will also be equipped with a secondary containment tray to contain potential spills.

- Upon removal of the hose from the Discharge Hopper disconnect, the end of the hose will be blanked off or put into a plastic bag which will be taped in place. The hose end will then be placed on the floor out of the way of traffic and access to other equipment.

- The Discharge Hopper skid and the Vacuum Pump skid (with demister and HEPA filter) will be transported from tent to tent on the 750 Pad by fork truck. Sludge transfer hosing from the Discharge Hopper to the Sludge Feed Tanks will be doubly contained.

- Radiological controls will be established within each tent as required by RFETS Radiological Protection Department.

- The treatment system process equipment in Tent 12 will be equipped with built-in trays providing secondary containment as a precaution against releases. Each secondary containment tray will have sufficient capacity to contain the volume of material that can be processed within the associated unit. Sludge transfer piping from the Sludge Feed Tanks to the Mixing/Blending Treatment System will be doubly-contained.

- The process equipment in Tent 12 will be maintained under slight negative pressure to prevent escape of particulate matter to tent workspace. The negative pressure will be maintained by enclosing the equipment as necessary, and by use of blowers. The air collected will be filtered through HEPA filters. The filtered air will be discharged outside Tent 12.

- The treated waste will be discharged to a Treated Waste Container. The Treated Waste Container will be equipped with an indexing "window shade" type cover with a port to accommodate the discharge chute of the Treated Waste Transport Conveyor. As the Treated Waste Container fills and advances beneath the discharge chute, the leading portion of the cover will roll up as the lagging portion rolls out. When the container is filled a manual slide gate will close the discharge chute as a precaution against accidental release of treated waste, and the discharge chute port on the container cover will be covered and latched.

- The Treated Waste Containers will be subject to inspection and removal of exterior loose material prior to transport from Tent 12.

6.2 PROCESS DESIGN

6.2.1 Units Description and Normal Operation

The Pond Sludge Treatment System consists of eight (8) units divided in six (6) areas as follows:

- Area 1000: One (1) Sludge Removal and Transfer Unit (SRTU)
- Area 2000: One (1) Sludge Feed Unit (SFU)
- Area 3000: Three (3) Treatment Additives Storage and Feed Units (ASFUs)
- Area 4000: One (1) Mixing/Blending Treatment Unit (MBTU)
- Area 5000: One (1) Treated Waste Storage and Transport Unit (TSTU)
- Area 6000: One (1) Treated Waste Recycle Unit (TWRU)

The SRTU is positioned next to whichever tent (Tent 3, 4, or 6) houses the interim storage tanks currently being emptied. The SFU, MBTU, TSTU and TWRU are located inside Tent 12. The ASFUs are located on the 750 Pad area south of Tent 12.

The purpose of this section is to describe the equipment of each of the above-listed units and the way it is intended to be operated and controlled under normal design conditions. Please also refer to the Process Equipment List provided in Part III - Appendix B of this report, and to the Piping and Instrumentation Diagrams (Drawings 51309-C003 through 51309-C007) provided in Part III - Appendix A for an additional illustration of the process equipment and controls.

6.2.1.1 Area 1000: Sludge Removal and Transfer Unit

The Sludge Removal and Transfer Unit (SRTU) consists of one Sludge Removal System (VTS-1001), one Sludge Transfer Pump (P-1001), two (one spare) Sludge Suction Wands (SP-1001), one Flush System Submerged Pump (P-1002), two (one spare) Flush System Wands (SP-1002), 2,000 ft of sludge and water transfer piping (PIP-1001), 400 ft of sludge suction piping (PIP-1002), 1,000 ft of containment piping (PIP-1003), one Oversized Waste Container (CON-1001), one Sludge Transfer Flow Indicating System (FIS-1001), one Sludge Transfer Mass Indicating System (MIS-1001), one Sludge Removal Level Control System (LCS-1001), and one Sludge Removal and Transfer Unit Control Panel (CP-1001). Operation of the SRTU also requires a Man-Lift (LFT-1001) to allow access to the top port of the interim storage tanks.

Alarmed conditions for the SRTU include HI and LO level of the Sludge Removal System discharge hopper. A high hopper level automatically stops the Sludge Removal System's vacuum pump and a low hopper level

automatically stops the Sludge Transfer Pump. The Sludge Removal and Transfer Unit Control Panel also features an EMERGENCY STOP pushbutton which deactivates all electrical equipment for the entire Pond Sludge Treatment System, except for the Sludge Feed Tank Mixers of the Sludge Feed Unit and for the exhaust blower of the Mixing/Blending Treatment Unit Dust Collection System.

The Sludge Removal System is a self-contained mobile device consisting of one vacuum pump, one enclosed cone-bottom (60°) discharge hopper, and one exhaust HEPA filter. The vacuum pump has a nominal capacity of 3,000 cubic feet per minute (cfm) at 15 inches of mercury (in. of Hg). The vacuum pump features a panel-mounted HAND-OFF-AUTO operating switch. With this switch in the AUTO position, which is the normal mode, the vacuum pump is automatically started and stopped by the HI and LO level switches of the Sludge Removal Level Control System. The discharge hopper has a volume of 100 cubic feet (ft^3) and is equipped with a manually-operated bottom discharge pinch valve. The rated throughput of this system is 500 to 1,000 pounds per minute (lbs/min) of pond sludge and, under normal conditions, its operating capacity ranges from 275 lbs/min for A/B Pond sludge to 380 lbs/min for C Pond sludge.

The Sludge Transfer Pump is a variable-speed progressive-cavity pump mounted underneath the cone-bottom discharge hopper of the Sludge Removal System. The Sludge Transfer Pump is mounted on the same mobile skid assembly as the Sludge Removal System. The Sludge Transfer Pump features a panel-mounted HAND-OFF-AUTO operating switch. With this switch in the AUTO position, which is the normal mode, the Sludge Transfer Pump is automatically started and stopped by the HI and LO level switches of the Sludge Removal Level Control System. The variable-speed mechanism of this pump is manually controlled to adjust pumping capacity from 0 to 50 gpm. Under normal operating conditions, the variable-speed control mechanism of this pump is set to provide a 30 gpm pumping rate.

The Flush System Submerged Pump is a submersible centrifugal pump positioned inside the interim storage tanks to recycle pond sludge within the tanks and create a swirling action that resuspends the settled solids in the sludge. The Flush System Submerged Pump has a rated capacity of 200 gpm and is designed to handle concentrated slurry and suspended solids debris. This pump features a local ON-OFF operating switch.

Each of the two Sludge Suction Wands consist of a 14 ft long section of 4 in. diameter semi-flexible vacuum rubber hose equipped with a manually-operated pinch-type flow control valve and quick-connect (Kamlock type) fitting. Each Sludge Suction Wand is also equipped with an integral flood light to illuminate the interior of the interim storage tank being emptied. The spare wand is provided so that it may be installed ahead of time into the next interim storage tank to be emptied.

Each of the two Flush System Wands consist of a 10-ft-long section of 2 in. diameter semi-flexible PVC or rubber hose equipped with a ball-type manually-operated flow control valve and quick-connect fitting. The spare wand is provided so that it may be installed ahead of time into the next interim storage tank to be emptied.

The Sludge Suction Transfer Piping consists of 50 ft long sections of 4-in.-diameter flexible vacuum rubber hose equipped with quick-connect fittings.

The sludge and water transfer piping each consist of 100-ft-long sections of 2-in.-diameter 150-pounds per square inch gauge (psig) rated reinforced rubber hose equipped with quick-connect fittings.

The containment piping consists of ten (10) 100-ft-long sections of 4-in. inside diameter (ID) collapsible fire hose equipped with locking collar fittings.

The Oversized Waste Container is a covered metal container 7.5 ft long, 4 ft wide, and 4 ft high with a capacity of 120 ft^3. The oversized material removed from the bottom of the Sludge Removal System discharge hopper is accumulated in this container. Once the container is full, it is removed to a staging area for testing and disposition and is replaced by an empty container.

The Sludge Transfer Flow Indicating System monitors the flow of the pond sludge being transferred to the SFU. The system includes an in-line flow-measuring element, a pipe-mounted flow transmitter, and a panel-mounted flow indicator.

The Sludge Transfer Mass Indicating System monitors the Total Suspended Solids (TSS) concentration of the pond sludge being transferred to the SFU. The system includes in-line turbidimeter solids-measuring element, a pipe-mounted transmitter, and a panel-mounted TSS indicator.

The Sludge Removal Level Control System regulates the level of pond sludge inside the discharge hopper of the Sludge Removal System. The system consists of a hopper-mounted ultrasonic liquid level measuring element, a local level transmitter, a panel-mounted level indicator, and HI and LO level switches and alarms.

The Sludge Removal and Transfer Unit Control Panel consists of a unit-mounted NEMA 4X enclosure with face-mounted controls and displays and a front-opening access door. Controls include a system-wide emergency shut-down push-button and a HAND-OFF-AUTO switch for the vacuum pump of the Sludge Removal System. Controls also include a HAND-OFF-AUTO switch and manual speed controller for the Sludge Transfer Pump. Displays include the Sludge Removal System discharge hopper level indicator (%

of full), the Sludge Transfer Flow System flow indicator (gpm) and solids content indicator (% solids), running lights for the pumps, and HI and LO level alarms for the Sludge Removal System discharge hopper.

The pond sludge is removed from the interim storage tanks by the vacuum pump of the Sludge Removal System through the Sludge Suction Wand, through the sludge suction piping, and into the cone-bottom discharge hopper of the Sludge Removal System. The pond sludge is then pumped to the SFU by the Sludge Transfer Pump through the sludge transfer piping. The containment piping is slipped over the sludge transfer piping to intercept any pond sludge leakage from that piping. As required, the contents of the interim storage tank being emptied are stirred through internal recirculation by the Flush System Submerged Pump. Also as required, flush water, heated if necessary, is pumped from the SFU through the water transfer piping, through the Flush System Wand, and into the interim storage tank being emptied to assist in the removal of the pond sludge from that tank.

The pond sludge removal from the interim storage tanks is controlled by an operator standing slightly above the top port of the tank being emptied on the Man-Lift. This operator regulates the rate of pond sludge removal based on visual observation by moving the Sludge Suction Wand around inside the tank and by manually throttling the control valve mounted on the wand which adjusts the suction of the Sludge Removal System vacuum pump. The operator of the Sludge Suction Wand can also start and stop the Flush System Submerged Pump as required by using a platform-mounted switch. If the use of flush water is necessary to assist in the removal of the pond sludge, a second operator also standing on the Man-Lift uses the Flush System Wand and regulates the flow of flush water by manually throttling the valve mounted on that wand.

The pond sludge transfer to the SFU is controlled by a third operator standing by the Sludge Removal and Transfer Unit Control Panel. This operator regulates the pond sludge transfer flow, based on the control panel level and flow displays, by manually adjusting the variable-speed control of the Sludge Transfer Pump.

As the rate of pond sludge removal from the interim storage tanks has to be closely matched to the rate of pond sludge transfer to the SFU, the Sludge Suction Wand operator is in close two-way radio contact with the operator standing by the Sludge Removal and Transfer Unit Control Panel. Since the rate of pond sludge transfer to the SFU is also dependent on the storage availability and operational status of that unit, the operator standing by the Sludge Removal and Transfer Unit Control Panel is also in close two-way radio contact with the SFU operators.

6.2.1.2 Area 2000: Sludge Feed Unit

The Sludge Feed Unit (SFU) consists of two Sludge Feed Tanks (D-2001, D-2002), two Sludge Feed Tank Mixers (A-2001, A-2002), two Sludge Feed Pumps (P-2001, P-2002), two Decant Pumps (P-2005, P-2006), one Process Water Tank (D-2003), one Process Water Pump (P-2003), one Flush Water Pump (P-2004), one Sludge Feed Flow Control System (FCS-2001), one Sludge Feed Mass Control System (MCS-2001), one Sludge Feed Conductivity Control System (CCS-2001), two Sludge Feed Level Control Systems (LCS-2001, LCS-2002), one Process Water Level Control System (LCS-2003), and one Sludge Feed Unit Control Panel (CP-2001).

Alarmed conditions for the SFU include HI and LO level of the Sludge Feed Tanks and Process Water Tank. A high Sludge Feed Tank level automatically stops the SRTU Sludge Transfer Pump and a low Sludge Feed Tank level automatically stops the operating Sludge Feed Tank Mixer and Sludge Feed Pump. A high Process Water Tank level automatically stops fresh water make-up. A low Process Water Tank level automatically starts fresh water make-up. The Sludge Feed Unit Control Panel also features an EMERGENCY STOP pushbutton which deactivates all electrical equipment for the entire Pond Sludge Treatment System, except for the Sludge Feed Tank Mixers and for the exhaust blower of the Mixing/Blending Treatment Unit Dust Collection System.

The SFU consists of two skids. One skid includes one Sludge Feed Tank (D-2001); its corresponding Sludge Feed Tank Mixer (A-2001), Sludge Feed Pump (P-2001), and Decant Pump (P-2005); the Process Water Tank, the Process Water Pump, and the Flush Water Pump. The second skid includes the other Sludge Feed Tank (D-2002) and the corresponding Sludge Feed Tank Mixer (A-2002), Sludge Feed Pump (P-2002), and Decant Pump (P-2006).

Each Sludge Feed Tank is a cylindrical, vertical, cone-bottom (40°) enclosed vessel mounted on legs. Tank dimensions are 10.0 ft diameter and 8.7 ft height with a capacity of 2,700 gal. Each tank is equipped with the corresponding top-mounted Sludge Feed Tank Mixer and Decant Pump; a peripheral circular overflow discharge launder; top-mounted sludge feed, flush water, and flush water recycle connections; and bottom-mounted sludge discharge and flush water connections. The bottom sludge discharge connection is located directly above the inlet of the corresponding Sludge Feed Pump and is equipped with a manually-operated pinch valve.

Each Sludge Feed Tank Mixer features a 2.0 ft diameter turbine type impeller and a manually-controlled variable-speed drive and gear-reducing mechanism. Each Sludge Feed Tank Mixer features a panel-mounted HAND-OFF-AUTO operating switch. With this switch in the AUTO position, which is the normal

mode, each Sludge Feed Tank Mixer is automatically started and stopped by the HI and LO level switches of the corresponding Sludge Feed Level Control System.

Each Decant Pump is of the self-priming horizontal centrifugal type with a 90 gpm capacity at 20 psig. Decant Pumps feature local ON-OFF operating switches.

Each Sludge Feed Pump is a progressive-cavity type with a manually-controlled AC variable-speed drive. Each Sludge Feed Pump features a panel-mounted HAND-OFF-AUTO operating switch. With this switch in the AUTO position, which is the normal mode, each Sludge Feed Pump is automatically started and stopped by the HI and LO level switches of the corresponding Sludge Feed Level Control System. Pump discharge rate is manually adjustable in the range of 0 to 40 gpm. Under normal operating conditions, the rate of pond sludge feed from the SFU to the MBTU is 16.7 gpm.

The Process Water Tank is a vertical cylindrical closed-top tank. Tank dimensions are 8.0-ft diameter and 9.0-ft height with a capacity of 2,700 gal. The Process Water Tank is equipped with four top-mounted inlet connections for decant water from each Sludge Feed Tank, fresh water make-up, and recycle water from the Process Water Pump. The Process Water Tank is also equipped with two bottom-mounted outlet connections for the Process Water Pump and the Flush Water Pump. The Process Water Tank features a 50 Kw thermostatically-controlled jacket electrical heater to raise the temperature of process/flush water and enhance its crystal-dissolving capacity, which may be necessary when handling C Pond sludge.

The Process Water Pump is of the horizontal centrifugal type with a nominal discharge capacity of 200 gpm at 112 psig. The Process Water Pump features a panel-mounted HAND-OFF-AUTO operating switch. With this switch in the AUTO position, which is the normal mode when flushing is required, the Process Water Pump is automatically started and stopped by the HI and LO level switches of the Process Water Level Control System. When required, this pump returns process water to the SRTU and interim storage tanks.

The Flush Water Pump is of the horizontal centrifugal type with a nominal discharge rate of 150 gpm at 50 psig. The Flush Water Pump features a panel-mounted HAND-OFF-AUTO operating switch. With this switch in the AUTO position, which is the normal mode when flushing is required, the Flush Water Pump is automatically started and stopped by the HI and LO level switches of the Process Water Level Control System.

The Sludge Feed Flow Control System monitors the flow of the pond sludge being fed to the MBTU and inputs that data into the MBTU logic controller. The system includes an in-line flow-measuring element, a pipe-mounted flow transmitter, and a panel-mounted flow rate indicator.

The Sludge Feed Mass Control System monitors the TSS concentration of the pond sludge being fed to the MBTU and inputs that data in the MBTU logic controller. The system includes an in-line TSS measuring element, a pipe-mounted transmitter, and a panel-mounted TSS indicator.

The Sludge Feed Conductivity Control System monitors the Total Dissolved Solids (TDS) concentration of the pond sludge being fed to the MBTU and inputs that data in the MBTU logic controller. The system includes an in-line conductivity-measuring element, a pipe-mounted transmitter, and a panel-mounted TDS concentration indicator.

The Sludge Feed Level Control Systems monitor the level of pond sludge in each Sludge Feed Tank and regulate the operation of the Sludge Feed Tank Mixers and Sludge Feed Pumps. Each system includes a tank-mounted ultrasonic-type level measuring element, a local level transmitter, a panel-mounted level indicator, and HI and LO level switches and alarms.

The Process Water Level Control System monitors the level of process water in the Process Water Tank and regulates the operation of the Process Water Pump and the Flush Water Pump. The system consists of a tank-mounted resistivity-type level measuring element, a local level transmitter, a panel-mounted level indicator, and HI and LO level switches and alarms.

The Sludge Feed Unit Control Panel consists of a unit-mounted NEMA 4X enclosure with face-mounted controls and displays and a front-opening access door. Controls include a system-wide emergency shut-down push-button and HAND-OFF-AUTO switches for the Process Water Pump and Flush Water Pump. Controls also include HAND-OFF-AUTO switches and manual speed controller for the Sludge Feed Pumps and Sludge Feed Tank Mixers. Displays include a pond sludge flow indicator (gpm), a pond sludge TSS indicator (% solids), a pond sludge TDS indicator (% solids), a Sludge Feed Tank Mixer speed indicator (rpm), Sludge Feed Tanks level indicators (% of full), Process Water Tank level indicator (% of full), running lights for pump and mixer motors, and HI and LO level alarms for the Sludge Feed Tanks and Process Water Tank.

The SFU is operated in a batch fill-and-draw mode. While one Sludge Feed Tank is being filled with a 2,500 gal batch of pond sludge from the SRTU, two 1,250 gal batches of pond sludge are drawn, one after the other, from the other previously-filled Sludge Feed Tank and sent to the MBTU. Inside each Sludge Feed Tank, flush water which may have been used for removal of the pond sludge from the interim storage tanks is separated from the pond sludge by decantation and transferred to the Process Water Tank, either by gravity overflow or by the Decant Pump. Also inside each Sludge Feed Tank, the decanted pond sludge is blended by the Sludge Tank Mixer to ensure a reasonably even sludge feed quality.

The filling of either Sludge Feed Tank with a batch of pond sludge is monitored by an operator standing by the Sludge Feed Unit Control Panel. This operator observes the rising liquid level inside the Sludge Feed Tank being filled, as indicated by the appropriate level panel display and signals to the SRTU operators via two-way radio when the filling operation is complete. Once the Sludge Feed Tank is full, this operator oversees the decantation of the flush water from the pond sludge and the transfer of that water to the Process Water Tank by operating the Decant Pump. This operator also oversees the blending of the decanted pond sludge by starting and stopping the Sludge Feed Tank Mixer and manually regulating its speed.

The drawing-down of a batch of pond sludge from either Sludge Feed Tank and its transfer to the MBTU are monitored by another operator also standing by the Sludge Feed Unit Control Panel. This operator observes the falling liquid level inside the Sludge Feed Tank being emptied, as indicated by the appropriate level panel display. This operator is in two-way radio contact with the MBTU operators and, in response to their signals, manually adjusts the rate of pond sludge feed to that unit as necessary by using the panel-mounted variable speed control for the operating Sludge Feed Pump.

A third SFU operator monitors the Sludge Feed Flow System and routinely computes, or re-computes as may be required, the quantities of pozzolanic reagent and hydrated lime to be added to the pond sludge to produce an acceptable treated waste. This computation is based upon the treatment formula(s) established by the pond sludge treatability study and upon the pond sludge flow and solids content data displayed on the Sludge Feed Unit Control Panel.

When the ASFUs and MBTU are operated in the manual mode (Additive Feed Systems control switches in the "ON" position and MBTU logic controller switch in the "HAND" position), the third SFU operator then relays this information via two-way radio for appropriate action by the ASFUs and MBTU operators.

When the ASFUs and MBTU are operated in the automatic mode (Additive Feed Systems and MBTU logic controller switches in the "AUTO" position), the information developed by the third SFU operator is only used for routine checking of the additive feed rates set by the MBTU logic controller.

6.2.1.3 Area 3000: Treatment Additives Storage and Feed Units

There are three Treatment Additives Storage and Feed Units (ASFUs). Two of these units store and feed pozzolanic reagents and the third unit stores and feeds hydrated lime. Each of the two pozzolanic reagent ASFUs consists of one Pozzolanic Reagent Storage Silo (SL-3001 or SL-3002), one Pozzolanic Reagent Additive Feed System (AFS-3001 or AFS-3002), one Pozzolanic Level Control System (LCS-3001 or

LCS-3002), and one Pozzolanic Additive Feed Unit Control Panel (CP-3001 or CP-3002). The hydrated lime ASFU consists of one Hydrated Lime Storage Silo (SL-3003), one Hydrated Lime Additive Feed System (AFS-3003), one Hydrated Lime Level Control System (LIS-3003), and one Hydrated Lime Additive Feed Unit Control Panel (CP-3003).

Alarmed conditions for the ASFUs include HI and LO level of the Storage Silos. A high Storage Silo level does not automatically start or stop any device but does alert operating personnel to stop reagent unloading operations. Low Storage Silo level automatically stops the operating Additive Feed Systems. The Pozzolanic and Hydrated Lime Feed Unit Control Panels also feature an EMERGENCY STOP pushbutton which deactivates all electrical equipment for the entire Pond Sludge Treatment System, except for the Sludge Feed Tank Mixers of the Sludge Feed Unit and for the exhaust blower of the Mixing/Blending Treatment Unit Dust Collection System.

Each of the two Pozzolanic Reagent Storage Silos consists of a 60° cone-bottom enclosed tank equipped with top fill and bottom discharge connections, top-mounted dust emission control system, and live-bottom mechanism. Each silo is 12.0 ft in diameter, 45.0 ft high, and has a storage capacity of 86 tons of pozzolanic reagent. The top fill connection is equipped with quick-connect fittings and the bottom discharge connection is equipped with a manually-operated knife-gate valve. The dust emission control system is of the passive type with a baghouse filter.

Each of the two Pozzolanic Reagent Additive Feed Systems consists of a rotary feed valve located at the cone-bottom discharge connection of the corresponding Pozzolanic Reagent Storage Silo, a weigh-belt conveyor located immediately underneath the rotary feed valve, and a horizontal screw conveyor located at the discharge of the weigh-belt conveyor and extending to the inlet of the screw conveyor (part of AFS-3003) that feeds reagents to the MBTU. The rotary valve feeder is 12.0 in. by 12.0 in. and is equipped with a manually-operated variable-speed drive. The weigh-belt conveyor is 2.0 ft wide by 7.0 ft long and is equipped with a manually-operated variable-speed drive to allow for adjustment of the pozzolanic reagent feed rate in the range of 0 to 30 tph. The screw conveyor is 9.0 in. in diameter by 20 ft long and is equipped with a manually-operated variable-speed drive to allow for adjustment of the pozzolanic reagent feed rate in the range of 0 to 30 tph. Under normal operating conditions this feed rate is 14.9 tph for treatment of C Pond sludge and 17.6 tph for the treatment of A/B Pond sludge.

The rotary valve feeder, weigh-belt conveyor, and screw conveyor feature panel-mounted HAND-OFF-AUTO operating switches. With the switches in the "AUTO" position, which is the normal operating mode, the MBTU logic controller automatically starts and stops the rotary feeder, weigh-belt conveyor, and screw feeder and adjusts their throughput based on the water-to-pozzolan set-point and on the flow and

solids/moisture content of the pond sludge. With the switches in the "AUTO" position, the rotary feeder, weigh-belt conveyor, and screw conveyor are also automatically stopped in case of low level in the Pozzolanic Storage Silos.

Each Pozzolanic Level Control System consists of a silo-mounted ultrasonic level-measuring element, a local level transmitter, a panel-mounted level indicator, and HI and LO level switches and alarms.

Each of the two Pozzolanic Additive Reagent Feed Unit Control Panel consists of a unit-mounted NEMA 4X enclosure with face-mounted controls and displays and a front-opening access door. Controls include a system-wide emergency shut-down push-button and an ON-OFF switch for the silo's live-bottom mechanism. Controls also include HAND-OFF-AUTO switches and manual/automatic variable-speed controllers for the rotary valve feeder, the weigh-belt conveyor, and the screw conveyor. Panel displays include speed/throughput indicators and running lights for the rotary valve feeder, the weigh-belt conveyor, and the screw conveyor. Displays also include silo level indication (% of full) and silo HI and LO level alarms.

The Hydrated Lime Storage Silo consists of a cone-bottom enclosed tank equipped with top fill and bottom discharge connections, top-mounted dust emission control system, and live-bottom mechanism. The silo is 10.0 ft in diameter, 32.0 ft high, and has a storage capacity of 35 tons of hydrated lime. The top fill connection is equipped with quick-connect fittings and the bottom discharge connection is equipped with a manually-operated knife-gate valve. The dust emission control system is of the passive type with a baghouse filter.

The Hydrated Lime Additive Feed System consists of a rotary feed valve located at the cone-bottom discharge connection of the Hydrated Lime Storage Silo, a weigh-belt conveyor located immediately underneath the rotary feed valve, and a screw conveyor located at the discharge of the weigh-belt conveyor and extending to the MBTU. This screw conveyor transfers both the pozzolanic reagent and the hydrated lime to the MBTU. The rotary valve feeder is 8.0 in. by 8.0 in. and is equipped with a manually-operated variable-speed drive. The weigh-belt conveyor is 2.0 ft wide by 7.0 ft long and is equipped with a manually-operated variable-speed drive to allow for adjustment of the hydrated lime feed rate in the range of 0 to 5 tph. The screw conveyor is 9.0 in. in diameter by 40.0 ft long and is equipped with a manually-operated variable-speed drive to allow for adjustment of the feed rate of the pozzolanic reagent and hydrated lime mix in the range of 0 to 30 tph. Under average design conditions this feed rate is 0.34 tph of hydrated lime and 17.6 tph of pozzolanic reagent for treatment of A/B Pond sludge and 0.48 tph of hydrated lime and 14.9 tph of pozzolanic reagent for the treatment of C Pond sludge.

The rotary valve feeder, weigh-belt conveyor, and screw conveyor feature panel-mounted HAND-OFF-AUTO operating switches. With the switches in the "AUTO" position, which is the normal operating mode, the MBTU logic controller automatically starts and stops the rotary feeder, weigh-belt conveyor, and screw feeder and adjust their throughput based on the flow and solids/moisture content of the pond sludge. With the switches in the "AUTO" position, the rotary feeder, weigh-belt conveyor, and screw conveyor are also automatically stopped in case of low level in the Hydrated Lime Storage Silo.

The Hydrated Lime Level Indicating System consists of a silo-mounted ultrasonic level-measuring element, a local level transmitter, a panel-mounted level indicator, and HI and LO level switches and alarms.

The Hydrated Lime Additive Feed Unit Control Panel consists of a unit-mounted NEMA 4X enclosure with face-mounted controls and displays and a front-opening access door. Controls include a system-wide emergency shut-down push-button and an ON-OFF switch for the silo's live-bottom mechanism. Controls also include HAND-OFF-AUTO switches and manual/automatic variable-speed controllers for the rotary valve feeder, the weigh-belt conveyor, and the screw conveyor. Displays include speed/throughput indicators and running lights for the rotary valve feeder, the weigh-belt conveyor, and the screw conveyor. Displays also include a silo level indicator (% of full) and HI and LO silo level switches and alarms.

The treatment additives are delivered to the ASFUs by bulk hopper trucks and transferred to the appropriate storage silo. The transfer from the hopper trucks to the storage silos is performed by a truck-mounted pneumatic transport and delivery system. Dust emissions resulting from the truck unloading operation are controlled by the baghouse filter of the storage silo being filled. Under normal operating conditions and depending on the type of pond sludge, between 4 and 5 truckloads a day of pozzolanic reagents and between 2 and 3 truckloads a month of hydrated lime are received and unloaded into the storage hoppers.

Inside the silos, the live-bottom mechanism prevents additive bridging and provides for even additive drainage from the silo bottom into the rotary valve feeder located immediately underneath it. The rotary valve feeder unloads the treatment additive onto the weigh-belt conveyor which regulates the rate of additive feed to the MBTU. The weigh-belt conveyor then unloads the additive into the screw conveyor which transfers it from the ASFU to the MBTU.

One operator oversees each ASFU. The ASFUs can be operated either in the manual mode or automatic mode.

In the manual operating mode (rotary feeder, weigh-belt conveyor, and screw conveyor control switches in the "HAND" position), each ASFU operator monitors the speed/throughput of the rotary valve feeder,

weigh-belt conveyor, and screw conveyor, as displayed on the unit control panel, and adjusts these as required based upon instructions received via two-way radio from the SFU and MBTU operators. When additive feed adjustment is required, the operator first adjusts the panel-mounted manual speed/throughput controller of the weigh-belt conveyor to the desired setting and then adjusts the settings of the panel-mounted manual speed controllers for the rotary valve feeder and screw conveyor to match the throughput of the weigh-belt conveyor.

In the automatic operating mode (rotary feeder, weigh-belt conveyor, and screw feeder control switches in the "AUTO" position), the MBTU logic controller automatically adjusts the pozzolanic reagent and hydrated lime feed rates based on the pond sludge flow and solids/moisture content data from the SFU. In this mode, each ASFU operator only monitors additive feed rates.

The ASFU operators also monitor the unloading of additive delivery trucks into the storage silos and, as required, assist the truck driver, in the set-up and operation of the pneumatic unloading system.

6.2.1.4 Area 4000: Mixing/Blending Treatment Unit

The Mixing/Blending Treatment Unit (MBTU) consists of one Mixing/Blending System (MBS-4001), one Treated Waste Scalping Screen (SCN-4001), one Fines Transfer Conveyor (CV-4001), one Treated Waste Transport Conveyor (CV-4002), one Recycle Conveyor (CV-4003), one Container Jockey System (JS-4001), one Dust Collection System (DCS-4001), one Dust Container (CON-4001), one Mixer Flush Water Tank (D-4001), one Mixer Flush Water Pump (P-4001), one Mixer Flush Level Control System (LCS-4001), and one Mixing/Blending Treatment Unit Control Panel (CP-4001).

Alarmed conditions for the MBTU include HI and LO level of the Mixer Flush Water Tank. A high Mixer Flush Water Tank level automatically starts the Mixer Flush Water Pump. Low Mixer Flush Water Tank level automatically stops the Mixer Flush Water Pump. The Mixing/Blending Treatment Unit Control Panel also features an EMERGENCY STOP pushbutton which deactivates all electrical equipment for the entire Pond Sludge Treatment System, except for the Sludge Feed Tank Mixers of the Sludge Feed Unit and for the exhaust blower of the Dust Collection System.

The Mixing/Blending System consists of a self-contained variable-speed twin-shaft covered pug mill. The nominal capacity of this pug mill is manually-adjustable in the range of 0 to 30 tph and, under normal operating conditions, it produces from 20 to 25 tph of treated waste, depending on the origin of the pond sludge being treated. The pug mill is equipped with a cone-bottom feed hopper, shaft-mounted pumping

paddles, a counter-current water flush connection and flush water drainage port, and a discharge chute which directs the treated waste to the Treated Waste Scalping Screen.

The Waste Scalping Screen consists of a covered vibrating screen featuring a 4.0 ft by 8.0 ft polyurethane screen deck with 2.0-mm size openings. The Waste Scalping Screen is located directly underneath the Mixing/Blending System's discharge.

The Fines Transfer Conveyor consists of a horizontal 9 in. diameter, 40-ft-long screw conveyor extending from beneath the Treated Waste Scalping Screen to the Recycle Conveyor. This screw conveyor is equipped with a manually-operated variable speed drive and has a capacity adjustable in the range of 0 to 40.0 tph.

The Treated Waste Transport Conveyor consists of a shrouded flexible pocket belt conveyor located at the discharge end of the Treated Waste Scalping Screen. This conveyor is 30.0 in. wide and 50.0 ft long and its belt features pocket segments 12.0 in. wide by 4.5 in. high. This conveyor is equipped with a manually-adjustable variable speed drive to allow for adjustment of the treated waste conveying rate in the range of 0 to 40 tph. Under normal operating conditions, the treated waste conveying rate varies depending on the origin of the pond sludge being treated.

The Container Jockey System consists of a two-way motorized winch, pulley, and cable system mounted on a frame integral with a short length of rail tracks. The Container Jockey System has a load pulling capacity of 30 tons. The Container Jockey System features a panel-mounted HAND-OFF-AUTO operating switch and a local clutch-type mechanical speed controller. With the switch in the "AUTO" position, which is the normal operating mode, the Container Jockey System automatically moves the Treated Waste Container back and forth along the rail tracks at the rate set with the local mechanical speed controller.

The Recycle Conveyor consists of an elevating 9 in. diameter, 43-ft-long screw conveyor extending from beneath the TWRU Waste Recycle System to the Mixing/Blending System. This screw conveyor is equipped with a manually-operated variable speed drive and has a capacity adjustable in the range of 0 to 40.0 tph.

The Dust Collector System consists of a network of emission collection manifolds and ductwork, a cone-bottom dry baghouse dust removal system, an HEPA filter, and a centrifugal exhaust blower. The HEPA filter is 24 in. by 24 in. with 0.5-micron pore size. The capacity of the exhaust blower is 1000 standard cubic feet per minute (scfm) with a discharge pressure of 0.5 psig.

Excess dust emissions are periodically blown-down into a Dust Container. This container is of the Tote type with a capacity of 48 ft^3 and is covered to prevent dust migration.

The Mixer Flush Water Tank and Mixer Flush Water Pump consists of a single skid-mounted system located next to the Mixing/Blending System. The Mixer Flush Water Tank is open-top vertical cylindrical, 5.0 ft in diameter, 5.0 ft high with a capacity of 575 gal. The Mixer Flush Water Pump is a vertical centrifugal pump mounted inside the Mixer Flush Water Tank. The Mixer Flush Water Pump features a panel-mounted HAND-OFF-AUTO operating switch. With this switch in the "AUTO" position, which is the normal operating mode, the Mixer Flush Water Pump is automatically started and stopped by the HI and LO level switches of the Mixer Flush Level Control System. Mixer Flush Water Pump capacity is 200 gpm with a discharge head of 50 psig.

The Mixer Flush Level Control System regulates the water level inside the Mixer Flush Water Tank. This system consists of a tank-mounted resistivity type level-measuring element, a local level transmitter, and a panel-mounted level indicator-controller with HI and LO level switches and alarms.

The Mixing/Blending Treatment Unit Control Panel is a unit-mounted NEMA 4X enclosure with face-mounted controls and displays and a front-opening access door. Controls include a system-wide emergency shut-down push button; ON-OFF switches for the Mixing/Blending System, the Fines Transfer Conveyor, the Treated Waste Transport Conveyor, the Recycle Conveyor, the Dust Collection System exhaust blower, and the Mixer Flush Water Pump; and a HAND-OFF-AUTO switch for the Container Jockey System. Controls also include a manual variable-speed controller for the Mixing/Blending System, the Fines Transfer Conveyor, and the Recycle Conveyor. Displays include feed rate indicators for the pond sludge, pozzolanic reagents, hydrated lime, and computed free moisture; a speed indicator for the Mixing/Blending System, the Fines Transfer Conveyor, and the Recycle Conveyor; a level indicator with HI and LO level alarms for the Mixer Flush Water Tank; and running lights for the above-mentioned electrical equipment. The Mixing/Blending Unit Control Panel also includes a solid-state programmable logic controller for automatic computing and controlling of the selected water-to-pozzolan (W/P) ratio. This logic controller is equipped with a HAND-OFF-AUTO control switch to select the operating mode.

The MBTU operates in a batch fashion with each 1,250 gal increment of pond sludge corresponding to one container-full batch of treated waste to be transferred to the TSTU. Under normal operating conditions, four such batches are produced each operating day.

The pond sludge is mixed, blended, and treated with the appropriate quantities of additives in the pug mill of the Mixing/Blending System. To ensure the production of an appropriately dry and friable treated waste,

a slight excess of pozzolanic reagent is mixed with the pond sludge in the pug mill. The treated waste exits the discharge end of the pug mill and falls through the discharge chute onto the deck of the Treated Waste Scalping Screen. On the screen deck, particles smaller than 2.0 mm, which could generate dust upon further handling, fall through the screen openings and are collected into the Fines Transfer Conveyor located directly underneath the Treated Waste Scalping Screen. Treated waste particles larger than 2.0 mm are conveyed by the vibrating action of the screen deck to a discharge chute and fall onto the Treated Waste Transport Conveyor. At the discharge end of the Treated Waste Transport Conveyor, the screened treated waste falls into one of the Treated Waste Containers of the TSTU. To ensure even distribution of the treated waste in the Treated Waste Container, The Container Jockey System slowly moves the container underneath the discharge chute of the Treated Waste Transport Conveyor. Treated waste particles smaller than 2.0 mm which have been collected by the Fines Transfer Conveyor are sent to the TWRU and returned to the pug mill by that unit as described below.

Periodically, the Mixing/Blending System pug mill must be back-flushed to remove excess accumulation of treated, or partially treated, waste. This is accomplished with water from the SFU Process Water Tank. Flush water is pumped from the SFU Process Water Tank to the flush connection located at the discharge end of the pug mill by the SFU Flush Water Pump. The water and flushed material then exit the pug mill from a drain port located near its front end and are collected into the Mixer Flush Water Tank. From there, the water and flush materials are transferred to the SFU Sludge Feed Tank 1 by the Mixer Flush Water Pump.

Dust emissions from the Mixing/Blending System, Treated Waste Scalping Screen, Fines Recycle System, Treated Waste Transport Conveyor, and Treated Waste Container are aspirated into the emission collection manifolds and ductwork and through the dry baghouse and HEPA filter of the Dust Collection System by the exhaust blower of that system. Periodically, the dust particulates accumulated in the baghouse are blown-down in the Dust Container, removed by the TWRU as described below and returned to the Mixing/Blending System for reprocessing.

One operator each oversees the Mixing/Blending System; the Treated Waste Scalping Screen, Fines Transfer Conveyor, and Recycle Conveyor; and the Treated Waste Transport Conveyor and Container Jockey System.

The operator of the Mixing/Blending System performs frequent visual checks to verify that the pond sludge and treatment additives are being correctly fed into the pug mill and that the texture of the treated waste discharging from the pug mill is consistent with requirements (i.e., not too dry and dusty or not too wet and sloppy). This operator keeps in close two-way radio contact with the other two MBTU operators and with

the operators of the SFU and ASFUs to report on pug mill operation, check on screen and conveyor operation, and to communicate the need for adjustment of the feed rate of pond sludge and/or treatment additives. At the end of each operating day, this operator also inspects the pug mill internals to determine if flush water is necessary.

The operator of the Waste Scalping Screen, Fines Transfer Conveyor and Recycle Conveyor performs frequent visual checks to verify that the fraction of treated waste fines being screened-out is consistent with expectations (i.e., about 5 to 10 percent of the pug mill discharge). As required, this operator manually adjusts the speed of the Fines Transfer Conveyor and Recycle Conveyor by using the panel-mounted controller. This operator is in close two-way radio contact with the other two MBTU operators and with the operators of the TWRU, SFU, and ASFUs to report on screening operations, check on pug mill and conveyor operation, and to communicate the need for adjustment of the feed rate of pond sludge and/or treatment additives.

The operator of the Treated Waste Transport Conveyor and Container Jockey System performs frequent visual checks to verify that the screened treated waste discharge smoothly from the conveyor and is being evenly distributed inside the Treated Waste Container. This operator also periodically checks that the screened treated waste accumulated inside the container does not have the tendency to unduly agglomerate either into large clumps or into a monolithic mass. This operator is in close two-way radio communication with the other two MBTU operators and with the operators of the SFU and ASFUs to report on conveying and containerizing operations, check on pug mill and screen operation, and to communicate the need for adjustment of the feed rate of pond sludge and/or treatment additives.

6.2.1.5 Area 5000: Treated Waste Storage and Transport Unit

The Treated Waste Storage and Transport Unit (TSTU) consists of twelve Treated Waste Containers (CON-5001 through CON-5012). In addition, at least one truck is required to transport the Treated Waste Containers to and from the MBTU and to and from the OU4 closure area.The Treated Waste Containers are of the roll-off type with end dump-gate and removable top covers. The bottom of the Treated Waste Containers is also equipped with small steel wheels for rolling on the tracks of the Container Jockey System. Each Treated Waste Container is 23.0 ft long, 8.0 ft wide, and 6.17 ft high with a nominal capacity of 30 yd^3.

The transport truck features an appropriate mechanism for the loading, transportation, and unloading of dumpster type roll-off containers.

At the end of each operating day, or whenever the filling of a Treated Waste Container is completed, the full container is unhooked from the MBTU Container Jockey System, and transferred by truck to the TSTU inside Tent 12. An empty container is then trucked from the 750 Pad outside the tent to the MBTU and hooked to the Container Jockey System.

After a curing period of one day at the TSTU, each container-full batch of treated waste is field-tested to verify that it meets the WAC. Field-testing consists of collecting one grab sample per batch, measuring the pH of that sample to verify that it is at least 12.0, and performing a Paint Filter Liquid Test (SW 9095) to verify the absence of any free water. To ensure that the collected grab sample is as representative as possible of the batch being tested, that sample actually consists of a mix of several grab samples collected at various locations and depth within the Treated Waste Container. Periodically, samples of treated waste are also collected and laboratory-tested in accordance with the Toxic Compounds Leaching Procedure (TCLP) to verify that leachate concentrations of uranium and other radionuclides and heavy metals satisfy WAC requirements.

After successful completion of the field tests, each container-full batch of treated waste is transferred by truck from the TSTU to the OU4 closure area where it is unloaded. The empty Treated Waste Container is then returned by truck to the TSTU for staging prior to reuse at the MBTU.

If a batch of treated waste fails the field tests, that Treated Waste Container is trucked back to the MBTU where its contents are removed by the TWRU as described below and returned to the MBTU for re-processing.

In addition to the truck driver, two operators oversee the staging/storage of the full Treated Waste Containers, the collection and field-testing of treated waste samples, and the staging of empty Treated Waste Containers. These operators also coordinate with the closure contractor the delivery of Treated Waste Containers to the OU4 closure area after successful completion of field tests.

6.2.1.6 Area 6000: Treated Waste Recycle Unit

The Treated Waste Recycle Unit (TWRU) consists of one Treated Waste Recycle System (VTS-6001), one Treated Waste/Dust Suction Wand (SP-6001), Treated Waste Suction Piping (PIP-6001), one Treated Waste Recycle Level Indicating System (LIS-6001), and a Treated Waste Recycle System Control Panel (CP-6001).

There are no alarmed conditions for the TWRU. The Treated Waste Recycle Unit Control Panel features an EMERGENCY STOP pushbutton which deactivates all electrical equipment for the entire Pond Sludge

Treatment System, except for the Sludge Feed Tank Mixers of the Sludge Feed Unit and for the exhaust blower of the Mixing/Blending Treatment Unit Dust Collector System.

The Treated Waste Recycle System is a skid-mounted self-contained device consisting of one vacuum pump, one enclosed cone-bottom (60°) discharge hopper, one rotary valve feeder located directly underneath the discharge hopper, and one vacuum pump exhaust HEPA filter. The vacuum pump has a nominal capacity of 2,400 cubic feet per minute (cfm) at 15 in. of Hg. The discharge hopper has a volume of 75 ft^3 and its bottom features a manually-operated pinch type discharge valve. The rotary valve feeder is 5 in. by 5 in. and is equipped with a manually-adjustable variable speed drive. The throughput of the system is manually-adjustable in the range of 0 to 500 lbs/min.

The Treated Waste/Dust Suction Wand consists of a 10-ft-long section of 4-in.-diameter semi-flexible vacuum rubber hose equipped with a pinch type manually-operated flow control valve and quick-connect (Kamlock type) fitting.

The Treated Waste Suction Piping consists of 50-ft-long sections of 4 in. diameter flexible vacuum rubber hose equipped with quick-connect fittings.

The Treated Waste Recycle Level Indicating System monitors the level inside the Treated Waste Recycle System discharge hopper. The system consists of a hopper-mounted ultrasonic level-measuring element, one local level transmitter, and a panel-mounted level indicator with HI and LO level switches and alarms.

The Treated Waste Recycle Unit Control Panel consists of a unit-mounted NEMA 4X enclosure with face-mounted controls and displays and a front-opening access door. Controls include a system-wide emergency shut down push button and an ON-OFF switch for the vacuum pump of the Treated Waste Vacuum Recycle System. Controls also include an ON-OFF switch and manual speed control for the rotary valve feeder of the Treated Waste Vacuum Recycle System. Displays include speed/throughput indicators for the rotary valve feeder of the Treated Waste Recycle System, and a level indicator for the Treated Waste Recycle System discharge hopper with HI and LO level alarms.

The Treated Waste Recycle Unit is used to collect three kinds of materials and recycle these to the MBTU Mixing/Blending System for re-processing:

- Off-specification treated waste from a TSTU Treated Waste Container
- Dust emissions particulates from the MBTU Dust Collection System baghouse
- Undersized particles from the MBTU Fines Transfer Conveyor

When a batch of treated waste fails the field tests, the Treated Waste Container is trucked next to the MBTU, and the off-specification treated waste is removed from the container by the vacuum pump of the Treated Waste Recycle System through the Treated Waste Suction Wand, through the Treated Waste Suction Piping, and into the cone-bottom discharge hopper of the Treated Waste Recycle System. The off-specification treated waste is then transferred to the MBTU Mixing/Blending System by the screw conveyor of the Treated Waste Recycle System.

The removal of the off-specification treated waste is controlled by an operator standing on a mobile stairs platform slightly above the rim of the Treated Waste Container being emptied. This operator regulates the rate of treated waste removal based on visual observation by moving the Treated Waste Suction Wand around inside the Treated Waste Container and by manually throttling the control valve mounted on the wand which adjusts the suction of the Treated Waste Recycle System vacuum pump.

The recycle of the off-specification treated waste to the MBTU Mixing/Blending System is controlled by an operator standing by the Treated Waste Recycle Unit Control Panel. This operator regulates the treated waste recycle rate based on the panel display by manually adjusting the variable-speed controls of the Treated Waste Recycle System rotary valve feeder and screw feeder.

The TWRU is operated in the same fashion within the MBTU to remove dust particulates accumulated in the Dust Collection System's Dust Container and recycle these to the Mixing/Blending System.

The TWRU is also operated in the same fashion within the MBTU to remove screened-off treated waste fines from the Fines Transfer Conveyor and recycle these to the Mixing/Blending System, except in this case, the function of the Suction Wand and Treated Waste Recycle System vacuum pump is fulfilled by the MBTU Fines Transfer Conveyor.

Since the rate of treated waste removal, either from the TSTU Treated Waste Container, or from the MBTU Dust Collection System baghouse, or from the MBTU Fines Transfer Conveyor, has to be closely matched to the rate of treated waste recycle to the Mixing/Blending System, the Treated Waste Suction Wand

operator is in close two-way radio contact with the operator standing by the Treated Waste Recycle Unit Control Panel. Since the rate of treated waste recycle to the Mixing/Blending System is also closely dependent with the operation of that system, the two TWRU operators are also in close two-way radio contact with the MBTU Mixing/Blending System operator.

6.2.2 Mechanical Check-Out and Initial System Operation

Prior to initial operation of the Pond Sludge Treatment System, each assembled unit of this system undergoes a two-tiered mechanical check-out.

The first-tier mechanical check-out, also referred to as a "dry test," consists of a thorough visual inspection of all units to insure that they have been properly installed in accordance with the approved construction drawings and with the equipment manufacturers' recommendations. Dry-testing also consists of checking that all equipment has been properly lubricated and of "bumping" all electrical motors, that is, to operate them for a few seconds to check for proper shaft alignment and direction of rotation. As part of the first-tier mechanical check-out, the ASFUs Storage Silos are filled with the appropriate treatment additives and checked for leakage and the SFU Process Water Tank is filled with clean service water and hydrostatically tested.

The second-tier mechanical check-out, also referred to as a "wet test" consists of operating all units as a system with actual treatment additives but with a clean artificial slurry and clean service water as surrogates for pond sludge and process/flush water, respectively. This "wet test" affords the opportunity to check-out the system under near normal operating conditions but without the risk of the consequence of a system failure with actual waste. During the "wet test", potential trouble spots such as equipment vibration or leaks are identified and remedied, instrument calibration is verified and adjusted as required, optimum observation and sampling points are identified and tested, and operating procedures are finalized based on actual experience.

Once the mechanical check-out has been successfully completed, the Pond Sludge Treatment System is placed in normal operation by removing the first 2,500 gal batch of pond sludge from a designated interim storage tank with the SRTU and transferring it to one of the SFU Sludge Feed Tanks. When the first SFU Sludge Feed Tank is full, treatment of the first 1,250 gal batch of pond sludge in the MBTU proceeds while a second 2,500 gal batch of pond sludge is transferred by the SRTU from the designated interim storage tank to the other SFU Sludge Feed Tank. After one day of cure time in the TSTU, the first container full/batch of treated waste is tested and, if acceptable, transferred to the OU4 closure area for disposal. If

not acceptable, this container full/batch of treated waste is recycled to the MBTU for reprocessing using the TWRU.

During the first normal day of operation, three 2,500-gal batches of pond sludge, instead of the normal two, are transferred by the SRTU from the interim storage tanks to the SFU Sludge Feed Tanks and only two tankfuls, or four 1,250-gal batches, are treated in the MBTU. In this way, it is possible to start the second and every subsequent day of operation with one SFU Sludge Feed Tank full so that pond sludge treatment operations can begin right away without having to wait for one of the SFU Sludge Feed Tanks to be filled.

6.2.3 Normal Daily/Short-Term System Start-Up and Shut-Down

As previously mentioned, the Pond Sludge Treatment System is started daily with one of the two SFU Sludge Feed Tanks full and the other essentially empty, which means that both the pond sludge removal and transfer team and the pond sludge feed and treatment team can start work at the same time and operate in parallel.

6.2.3.1 Pond Sludge Removal and Transfer

Daily pond sludge removal and transfer operations proceed in two increments, each corresponding to the removal and transfer of a 2,500-gal batch of pond sludge from the interim storage tanks to the SFU Sludge Feed Tanks. Each of these operational increments requires a short-term start-up and shut-down sequence of operations.

The short-term start-up sequence of pond sludge removal and transfer operations consists of the following:

- Get the SRTU Sludge Suction Wand and Flush System Wand operators in position.
- Check that the SRTU Sludge Suction Wand is properly immersed in the pond sludge and that the SRTU Flush System Wand is ready for use if required.
- Start the SRTU Sludge Removal System vacuum pump and SRTU Sludge Transfer Pump.
- Adjust the position of SRTU Sludge Suction Wand as required.
- Position the SRTU Flush System Wand and start SRTU Process Water Pump as required.

- Start SRTU Flush System Submerged Pump as required.
- Start SRTU Process Water Tank heater as required.
- Check flow and TSS displays.
- Monitor the liquid level display for the SFU Sludge Feed Tank being filled.
- Start the appropriate SFU Sludge Feed Tank Mixer when submerged.
- Adjust the discharge rate of the Sludge Transfer Pump as required based on indication from the SRTU Sludge Suction Wand operator and the liquid level display for the SRTU Sludge Removal System discharge hopper.

Every other day the short-term start-up sequence of pond sludge removal and transfer operations also consist of repositioning the primary and spare Sludge Suction Wand and Flush System Wand in the next interim storage tank to be emptied.

The short-term shut-down sequence of pond sludge removal and transfer operations consists of the following:

- Stop SRTU Process Water Pump and/or SRTU Flush System Submerged Pump, if operating.
- Stop SRTU Sludge Removal System vacuum pump.
- Monitor liquid level in SRTU Sludge Removal System discharge hopper and stop SRTU Sludge Transfer Pump when hopper is empty.

In addition, if the short-term shut-down is scheduled to last more than one to two hours, such as at the day's end or week-end stoppage, the sequence of shut-down operations must include flushing of the sludge suction and transfer piping with process water.

6.2.3.2 Pond Sludge Feed and Treatment

Daily pond sludge feed and treatment operations proceed in four increments, each corresponding to the feed of a 1,250 gal batch of pond sludge and the generation of one full container of treated waste. Each of these operational increments requires a short-term start-up and shut-down sequence of operations.

The short-term start-up sequence of pond sludge feed and treatment operations consists of the following:

- Analyze the contents of the SFU Sludge Feed Tank being fed and treated, and compute required feed rates of treatment additives.
- Turn the ASFUs Additive Feed Systems control switches to the "ON" position and the MBTU logic controller switch to the "HAND" position for initial manual operation.
- Start Dust Collection System exhaust blower.
- Start MBTU Mixing/Blending System, SFU Sludge Feed Pump, ASFUs Pozzolanic Reagent Additive Feed System, and ASFUs Hydrated Lime Additive Feed System.
- Adjust as required the feed rates of the ASFUs Pozzolanic Additive Reagent Feed System and ASFUs Hydrated Lime Additive Feed System.
- Start MBTU Treated Waste Scalping Screen, MBTU Treated Waste Transport Conveyor, and MBTU Fines Transfer Conveyor.
- Start MBTU Container Jockey System.
- Start TWRU Treated Waste Recycle System screw conveyor.
- Once the system is running, go to automatic operating mode by turning the ASFUs Additive Feed Systems and MBTU logic controller switches to the "AUTO" position.

The short-term shut-down sequence of pond sludge feed and treatment operations is as follows:

- Stop SFU Sludge Feed Pump.

- Stop ASFUs Pozzolanic Reagent Additive Feed System and Hydrated Lime Additive Feed System.

- Stop MBTU Mixing/Blending System.

- Stop MBTU Treated Waste Scalping Screen.

- Stop MBTU Fines Transfer Conveyor and TWRU Treated Waste Recycle System screw conveyor.

- Stop MBTU Treated Waste Transport Conveyor.

- Stop MBTU Container Jockey System.

- Remove full TWRU Treated Waste Container and replace with empty one.

- Stop MBTU Dust Collector System exhaust blower.

In addition, if the short-term shut-down is scheduled to last more than one to two hours, such as at the day's end or week-end stoppage, the sequence of shut-down operations must include water flushing of the pond sludge feed line from the SFU Sludge Feed Tank to the MBTU Mixing/Blending System as well as water backflushing of the MBTU Mixing/Blending System. Finally, at the end of each operating day, when one of the SFU Sludge Feed Tank is essentially empty, the corresponding SFU Sludge Feed Tank Mixer is stopped.

6.2.4 Long-Term System Shut-Down/Decommissioning

When the Pond Sludge Treatment System is to be idle for a long period of time or treatment operations have been completed, the following steps must be implemented for the long-term shut-down and/or decommissioning of the system:

- All tanks and process units (pumps, mixers, hoppers, conveyors, etc.) are decontaminated with fresh water and drained. As necessary, low-pressure steam cleaning and/or mechanical scrubbing with detergents and/or solvents may also be used for decontamination.

- All unit internal piping is decontaminated as described above and drained. Operating valves are removed. Flanged connections are broken and blinded.

- All unit-to-unit interconnecting piping is decontaminated as described above, drained, disconnected, and removed.

- Waste decontamination fluids are transferred to the Building 374 Spray Dryer for disposal.

- Field instruments are disconnected and removed.

- All electric motors are disconnected and removed.

- Control panels are disconnected and removed.

- Treatment additives storage silos are emptied and the additives will be removed, transported and either stockpiled, used, or disposed of elsewhere within the RFETS.

6.2.5 Emergency System Shut-Down

Each of the individual unit control panels is equipped with an emergency shut-down button. In case of emergency, such as gross system malfunction or large waste spillage or dust emission blow-out, any one of these buttons can be used to stop all the Pond Sludge Treatment System electrical motors, except those of the MBTU Dust Collection System exhaust blower and SFU Sludge Feed Tank Mixers.

Once the cause and nature of the emergency has been clearly determined and a remedial course of action has been decided upon, the Pond Sludge Treatment System can then be reactivated on a unit-by-unit or equipment item-by-item basis in accordance with the remedial course of action.

6.2.6 Process Trouble Shooting

Table 6-1 provides a list of potential process malfunctions that may occur as part of the operation of the Pond Sludge Treatment System as well as the potential causes and remedies for these malfunctions.

6.3 MECHANICAL DESIGN

6.3.1 Introduction

The process train to reclaim and treat the pond sludge in interim storage in tanks on the 750 Pad is predominantly new equipment and fabrications. However, some of the previously constructed skid modules

TABLE 6-1

PROCESS TROUBLE SHOOTING
POND SLUDGE TREATMENT SYSTEM
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

Process Malfunction	Probable Cause	Remedy
Pond sludge hard to remove from interim storage tanks and transfer to SRTU Sludge Removal System discharge hopper.	• SRTU Sludge Suction Wand plugged. • SRTU Sludge Removal System vacuum pump provides insufficient suction. • Pond sludge too thick or viscous.	• Unplug wand. • Increase vacuum pump suction with the wand control valve. • Stir contents of interim storage tank with Flush System Wand and/or Flush System Submerged Pump. If required, use heated process water for flushing.
Pond sludge flow from the SRTU Sludge Removal System discharge hopper to the SFU Sludge Feed Tanks has stopped or slowed.	• SRTU Sludge Removal System discharge hopper empty • SRTU Sludge Removal System discharge hopper bottom slide gate and/or pinch valve are closed • SRTU Sludge Transfer Pump off or clogged. • Sludge transfer line plugged.	• Check discharge hopper level switches and indicators. • Open discharge hopper slide gate and/or pinch valve. • Check operation of Sludge Transfer Pump and/or flush pump with process water. • Check sludge transfer line for plugging and flush with process water as required.
Process flush water exhibits high suspended solids concentration.	• SFU Decant Pumps are drawing sludge in the process flush water. • Pond sludge solids concentration is such that no process water is decanting in the SFU Sludge Feed Tank.	• Reposition suction line of the Decant Pumps. • Stop Decant Pumps. Avoid overflow from Sludge Feed Tanks to Process Water Tank. If required use fresh service water for flushing.
Treated waste too wet and/or sticky.	• Insufficient pozzolanic reagent addition. • Insufficient mixing time in MBTU Mixing/Blending System.	• Check pozzolanic reagent supply and increase feed rate. • Decrease pond sludge feed rate and/or speed of MBTU Mixing/ Blending System paddles.
Treated waste too dry and dusty.	• Excessive pozzolanic reagent addition.	• Decrease pozzolanic reagent feed rate.
Excessive amount of screened undersized particles.	• Excessive pozzolanic reagent addition. • Insufficient mixing time in MBTU Mixing/Blending System.	• Decrease pozzolanic reagent feed rate. • Decrease pond sludge feed rate and/or speed of MBTU Mixing/ Blending System paddles.
Treated waste sets-up in a monolithic mass.	• Excessive pozzolanic reagent addition. • Excessive proportion of Portland cement within the pozzolanic mix.	• Decrease pozzolanic reagent feed rate. • Decrease Portland Cement proportion within pozzolanic mix.

for the 1993 solar pond sludge treatment and handling system are, in total or in part, used in this current treatment system design. In addition, a number of the existing equipment and instrumentation, originally purchased for use in the 1993 treatment system are also utilized in this design.

The design philosophy for the Pond Sludge Treatment System is based on a Temporary Unit (TU) standard. Specifically, each fabricated equipment module is self-contained with an integrated electrical and control panel, and rigid connecting piping between the equipment within the module. Electrical interconnections between modules are accomplished by shielded electrical cables which are routed along the surface of the 750 Pad and protected by cross-over ramps or covers, but not in rigid cable trays or racks.

Likewise, piping connections between modules utilize flexible rubber hose with high-pressure, leak-resistant, safety-locked quick disconnect fittings (e.g., Kamlock double O-ring). Double-containment of pipelines outside of contained skid modules is provided, as necessary, using flexible fire hose sleeves over the flexible rubber hose which also interconnect with standard fire hose locking ring fittings. The open ends of the containment piping terminate within the containment areas of the source and target modules. Suction hoses for the vacuum reclaim systems are made of flexible, wire-reinforced rubber vacuum hosing. The suction lines are not double-contained since they will be operated under negative pressure and will be sucked dry and capped after use to prevent any spillage.

Where dry and potentially dusty additive or treated waste streams are present, active or passive dust collection systems are used. Where high volumetric air flows for dust control are used, (i.e., the Dust Collection System for the Treatment Mixing/Blending Unit, Treated Waste Scalping Screen, Treated Waste Transport Conveyor and discharge shroud into the Treated Waste Container), a combination active baghouse, HEPA filter system is used. HEPA filters are also installed on the discharges of the Sludge Removal System and Treated Waste Recycle System vacuum pumps. The filters shall conform to RFETS Standard SMU-401, shall have been tested and approved by RFETS, and will be procured from RFETS. The plenums housing the filters shall be designed to ASME Standard N509, and will pass ASME Standard N510 leak testing. The entire air filtration system shall be designed in accordance with RFETS Standard SMU-302.

For the slurry or wet sludge handling units, all tanks will be covered but will not be sealed or placed under negative pressure and vented through dust or HEPA filters since no airborne particulates are anticipated. However, these systems are designed to prevent any mist or liquid emissions.

Secondary containment is provided on the liquid or slurry handling and storage units. The equipment skid modules handling slurry are provided with containment capacity to handle approximately 110% or more of the maximum volume of the largest vessel on a specific skid. The extra volume should more than allow for

a maximum rainfall containment for any skid which is outside and exposed to rain (i.e., the Sludge Removal System module). Each skid also is provided with a small sump area below the floor plate grade to which any extraneous water will drain. A small portable submersible pump, or suction from a vacuum unit can be used to remove any extraneous liquids from the sumps, as necessary.

The skid modules are supported by rectangular steel box beams which also provide the rigid frame and support around the skid periphery. The floor plate is 1/4 in. steel checkered deck plate. Tank, pumps, control panels are supported by welded or bolted supports to the reinforced deck plate. The containment skirt is 1/4 in. welded steel plate with angle or channel reinforcement. Pipe supports, where required, are angle or channel sections also welded to the skirt sides or deck plate. The deck, containment skirt, and sump are welded into a sealed system for secondary containment. All fabricated vessels, skid modules, pump bases, and supporting structures are shot-blasted, primed, and painted with corrosion resistant epoxy paint to facilitate cleaning and decontamination.

6.3.1.1 Area 1000: Sludge Removal and Transfer Unit

The Sludge Removal and Transfer Unit (SRTU) consists of a Sludge Removal System (VTS-1001), a Sludge Transfer Pump (P-1001) and a control panel (CP-1001). The Sludge Removal System has been designed with the following components:

- A HI-VAC Model 2100 vacuum pumping system with 3,000 cfm at 15 in. of Hg vacuum capacity. This system is capable of transferring 500 to 1000 lbs of wet/dry materials. It is self-contained on its own skid [approximately 10.3 ft wide (W) by 12.3 ft long (L) by 7.0 ft high (H)] and weighs about 8,000 lbs. It is connected to the wet/dry vacuum intercept hopper which is mounted on its own containment skid structure. The vacuum pump is equipped with internal demisting and filter systems. However, it also discharges through a system of four HEPA filters (3 operating, 1 standby).

- A 100 ft^3 wet/dry vacuum discharge hopper with 60° rectangular-sloped sides for receiving the reclaimed sludge. It is equipped with a counter-weighted single slide-gate discharge for oversized solids and a 6 in. NPS flanged discharge pipe connection for slurry feed to the Sludge Transfer Pump. The entrance to this pump feed pipe is protected by a wedge-wire screen which prevents 1/2 in. or greater solids (rocks, asphalt, etc.) from entering the pump. The above counter-weighted slide gate is periodically opened and the oversize solids are discharged into a suitable container (4 ft x 4 ft x 7.5 ft) for manual disposal. The discharge hopper and Sludge

Transfer Pump located below it are mounted on a separate skid (11.5 ft x 14 ft) from the vacuum pump system. They are connected by a 4 in. diameter spiral wound rubber suction hose.

The Sludge Transfer Pump (P-1001) is a progressive-cavity MOYNO pump with 4 in. discharge, variable-speed drive which delivers sludge from the discharge hopper to the Sludge Feed Tanks. It has a 0-50 gpm capacity at 100 psig for the relatively viscous sludge. The pump discharges into a long-profile 4 in. to 2 in. diameter reducer which discharges into a straight run of 2 in. diameter high-density polyethylene (HDPE) pipe, which is used as a measurement run for the Sludge Transfer Flow Indicating System (FIS-1001), consisting of a pressure gage, suspended solids, mass flow and density measurement instrumentation. The flow system is used primarily in an open-loop mode to track the sludge transfer rate to the Sludge Feed Tanks.

A local control panel (CP-1001) is mounted on the discharge hopper skid. An emergency push button for treatment system-wide shutdown is also provided.

6.3.1.2 Area 2000: Sludge Feed Unit

The Sludge Feed Unit (SFU) receives the sludge pumped from the Sludge Removal System which is located outside on the 750 pad area at the end of the tent from which the sludge is being reclaimed. The Sludge Feed Unit, which consists of two feed tanks, a process water tank, and associated pumps is contained on two skid modules which are located inside Tent 12 at the head of the treatment train.

The first skid module, 12 ft W x 33.5 ft L x 12.5 ft H, utilizes much of the equipment and the original skid base built for the earlier pond sludge process system (Module 207A/B-07). Located on this skid are:

- Sludge Feed Tank 1 (D-2001), which is a new fabrication mounted on the skid in place of the earlier Dirty Water Separator. This feed tank is a 10 ft in diameter by 4 ft SSH with a 40° cone section bottom to facilitate sludge discharge. Four 6 in. H x 6 ft L baffle plates are welded to the inside cone section to facilitate mixing and homogenization of the sludge. Total working volume is approximately 2,700 gal which will accommodate approximately one-half of a batch feed to the Mixing/Blending Treatment Unit. The tank is covered with a reinforced steel plate cover into which the feed streams are directed and which provides mounting for a small, self-priming Decant Pump. An independent bridge of steel channel is provided over the tank to support an agitator, motor and gearbox. The top of the bridge is approximately 13 ft from the floor. The steel tank is supported by four legs such that the cone discharge, into a 6 in. diameter feed pipe, is about 3.5 ft above the skid containment deck plate.

The Sludge Feed Tank is equipped with a peripheral overflow such that any excess process water used during the reclaim operations can be decanted to the Process Water Tank for reuse and recycle. This overflow is located at elevation 11 ft and allows gravity flow into the Process Water Tank at elevation 10.5 ft through side-mounted 6 in. diameter entry pipe flanges.

- After the feed tank is filled sludge is allowed to settle, the Decant Pump (P-2005) is used to decant any excess free water into the Process Water Tank. This pump, which is mounted on the Sludge Feed Tank cover, is a self-priming centrifugal type (Teel Model 2P374), with 90 gpm at 20 ft TDH capacity. It has a suction inlet on a buoyant ring which floats on the top surface of the sludge and liquid in the tank. It discharges into the overflow launder discharge pipe.

- The tank's cone discharge nozzle can be isolated from the discharge pipe using a slide-gate valve mounted on the cone discharge flange. A flush water connection and a pinch valve to regulate slurry flow and back-pressure in the feed to the Sludge Feed Pump (P-2001) are also mounted in the cone discharge line (6 in. diameter).

- The Sludge Feed Pump (P-2001) is a progressive-cavity type (Moyno Model 2E012G1-CDQ-HSA), that was part of the earlier Dirty Water Separator System. It has a capacity of 0-40 gpm at 50 psig TDH with the highly viscous sludge. Speed is controlled by a variable-frequency, controller. It discharges through a rigid pipe measurement run in which are mounted a slurry-isolated pressure gauge, a mass flow meter, a conductivity probe for TDS measurement and turbidimeter for measuring TSS in the feed slurry.

- A variable-speed (variable-frequency) Sludge Feed Tank Mixer is provided to help keep the sludge contents homogenized and to facilitate pumping. An existing agitator drive (Burnham-Sharp Model XLG-500) , 7.5 hp, is used. It is equipped with a 2 ft diameter, axial-flow, pumping impeller (Lightnin A-310) for slurry suspension and circulation.

- The instrument displays, equipment status lights, tank level indication, ON-OFF switches and motor controls are mounted in a skid control panel (CP-2001) that also serves the equipment on the alternate Sludge Feed Tank 2 (D-2002) skid. All equipment on the skid are interlocked with a system-wide emergency shut-down push button mounted on the panel.

Also located on the Sludge Feed Tank 1 skid are the Process Water Tank (D-2003) and associated pumps. This tank provides recycle process water for sludge reclaim, and line and equipment flushing. Specifically provided are:

- A Process Water Tank (D-2003) which is used to store recycle process water and to feed the Process and Flush Water Pumps (P-2003 & P-2004). This covered cylindrical steel tank (8 ft. diam. by 9 ft H) with a sloping false bottom provides water to the pump suctions. It has been modified from the original design to have two 6 in. diameter NPS-flanged entry pipes for the overflow decant from the Sludge Feed Tanks (D-2001, D-2002). The tank has a working volume of approximately 2,700 gal. Fresh water can also be added, as necessary, to makeup the process water supply. The Process Water Tank is equipped with externally-mounted electrical heating control panel with a total rating of 50 Kw.

- The Process Water Pump (P-2003) is a fixed-speed, centrifugal slurry pump (Wilfley Model AG, 4 in. x 3 in.) with 200 gpm at 112 psig TDH. It provides process water for recycle and reclaim system use. It is mounted on an elevated base located adjacent to the Process Water Tank on the same skid module as the Sludge Feed Tank 1 (D-2001).

- The Flush Water Pump (P-2004) is also a fixed-speed, centrifugal slurry pump (Wilfley Model AG, 3 in. x 2 in.) with 150 gpm capacity at 50 psig. It is also mounted on an elevated base on the skid. It delivers flush water to the Sludge Feed Tanks (to the bottom of the cone and to the top of the tank) as well as to the Mixing/Blending System (MBS-4001) of the Mixing/Blending Treatment Unit (MBTU) for flushing, as required.

Sludge Feed Tank 2 (D-2002), identical to Sludge Feed Tank 1 (D-2001), is mounted on a separate skid module of similar construction. It provides capacity to receive sludge from the SRTU and provides sludge feed to the MBTU Mixing/Blending System in an alternate fill/draw cycle to Sludge Feed Tank 1. Equipment on this skid are connected to, and are controlled from, the control panel (CP-2001) mounted on Sludge Feed Unit 1 skid. This Sludge Feed Unit 2 skid (11.5 ft W x 19 ft L), which is located in Tent 12 adjacent to the Sludge Feed Tank 1 skid, provides support and secondary containment for the following:

- Sludge Feed Tank 2 (D-2002), which is identical in design to Sludge Feed Tank 1 (D-2001). The tank overflow decant flows by gravity to the Process Water Tank located on the other Sludge Feed Unit skid.

- The progressive-cavity Sludge Feed Pump (P-2002) is the same as P-2001. It also connects through a "Y"-fitting to the flow and sludge characteristic measurement run also located on the other Sludge Feed Unit skid.

- Sludge Feed Tank 2 is also provided with a variable-speed, slurry pumping Sludge Feed Tank Mixer (Burnhams-Sharp Model XLG-500) with Lightnin A-310 impeller.

The Sludge Feed Flow Control System, Sludge Feed Mass Control System, and Sludge Feed Conductivity Control System are located on a recirculation loop on the discharge of the Sludge Feed Pumps. This recirculation loop is identified as the "measurement run" and allows for the determination of the characteristics of the pond sludge contained in either of the Sludge Feed Tanks and the return of that sludge to the appropriate Sludge Feed Tank prior to actual feed of the sludge to the MBTU.

6.3.1.3 Area 3000: Treatment Additive Storage and Feed Units

Each of the three Treatment Additive Storage and Feed Units (ASFUs) consist of a Storage Silo (SL-3001, SL-3002, SL-3003), and an Additive Feed System (AFS-3001, AFS-3002, AFS-3003) including a rotary-valve feeder, a weigh-belt rate control conveyor, and a transport screw conveyor. Two of these units operate with pozzolanic reagents and one operates with hydrated lime. These units are located outside of Tent 12 along the south side, which allows access for filling from delivery trucks with self-contained pneumatic feeding systems. The storage silos are supported by steel beam columns which rest on a load-spreading foundation.

Two ASFUs are provided for the storage of pozzolanic reagents and can contain the same or different blended mixture of Type I or II Portland cement and Type C fly ash or either Portland cement or fly ash alone. The feed rate from each pozzolanic ASFU is individually controlled and specified through the MBTU logic controller (with water/pozzolan ratio (W/P) input) or manually-controlled using pozzolan mass flow (P) indication. Each pozzolanic ASFU consists of:

- A Pozzolan Storage Silo (SL-3001 or SL-3002). This storage silo is 12 ft in diameter x 24 ft SSH cylindrical steel tank with a 60° cone discharge section. Each silo is sized to hold 100 yd^3 or about 90 tons of mixed pozzolan reagent (2/1: fly ash/cement ratio). The silos are equipped with a live-bottom (vibrating double-cone type or equivalent) which facilitates delivery of dry, bulk fine solids. The silos are top fed through a pneumatic connection to the bulk pozzolan delivery tankers. Each has a passive dust collection system to prevent emissions during filling. The silos are also equipped with an ultra sonic level sensing system which provides HI and LO level alarms and feed system cut-off as well as continuous tank level indication.

- A 2 ft W x 7 ft L weigh-belt feeder (Merrick Model 455) on each storage silo rotary valve (12 in. by 12 in.) discharge senses the reagent delivery rate, inputs the observed rate to the logic

controller (part of AFS-3001 or AFS-3002) which, in turn, regulates the speed drive of the rotary feeder and the delivery screw conveyor accordingly. It has a built-in lag-time function to compensate for time delay between the measuring point and the rotary feeder. It will control to +/-0.25% of set rate.

- The reagents are delivered by the weigh-belt and discharge into the screw conveyors (9 in. diameter by 20 ft L) which transport the pozzolans to a central elevating screw conveyor which, in turn, delivers the mixed reagent blend to the MBTU within Tent 12.

The hydrated lime ASFU includes a Storage Silo (SL-2001) that is an existing 10 ft diameter x 14.8 ft SSH steel silo (formerly a cement silo in the Rockwell pug mill circuit) which has been modified to incorporate the top filling, passive dust collection, level sensing, live bottom and rotary valve feeder systems similar to those on the pozzolan silos. It is estimated to have a 40 yd^3 capacity or about 35 tons for hydrated lime.

Also included in the Hydrated Lime ASFU is:

- A variable-speed, 8 in. x 8 in. rotary valve that is driven by a similar 2 ft x 7 ft weigh-belt feeder (Merrick Model 455) which incorporates a lag-time function. The lime mass rate (L) is manually set or is automatically-controlled by the Mixing/Blending Treatment Unit logic controller as a ratio (L/M) to the sludge mass flow (M).

- The hydrated lime weigh-belt and both of the pozzolan screw conveyors discharge directly into the enclosed feed hopper of an elevating screw conveyor (9 in. diameter x 40 ft length), which mixes and transports the dry, bulk pozzolans and lime to the Mixing/Blending Treatment Unit. This is a variable-speed conveyor which is manually-adjusted to minimize transport lag in the reagent delivery system.

Each storage silo and feed control system has its own local control panel (CP-3001, CP-3002, CP-3003) which are mounted on the support beams of the silos. Level indication, feeder speed and flowrate are displayed and controlled from the local panel. The control functions and emergency shut-off are tied into the Mixing/Blending Treatment Unit logic controller.

6.3.1.4 Area 4000: Mixing/Blending Treatment Unit

The treatment process for the pond sludge occurs in the Mixing/Blending Treatment Unit. The specific components of this system are discussed below:

- The Mixing/Blending System (MBS-4001) is a pug mill mixer (Sprout-Bauer, severe duty, 21 in. wide by 8 ft long inside dimensions, with variable-frequency, 60 hp electric drive). Operating capacity ranges between 0 and 30 tph of treated waste. The mixer is dual-shafted with pumping paddles and it has a slide-gate discharge to regulate the internal fill level and to permit isolation from down-stream, treated waste-handling operations during periods when the mixer is cleaned by water flushing.

- The mixer is equipped with a flush outlet valve on the feed end and a flush water input on the discharge end to permit counter-current flushing with water, as required.

- The various feeds (i.e., dry bulk reagent, recycle fines from the scalping screen, recycle dust and the pond sludge slurry) enter the mixer in an enclosed, conical feed hopper which discharges into an entry feed port (21 in. x 24 in.).

- The mixer is equipped with a plexiglass view port (21 in. x 21 in.) near the discharge end. This will permit visual monitoring of the treated waste product and the fines in the mixer discharge and screen feed.

- The Mixing/Blending System is elevated and mounted on a steel beam pedestal frame 13 ft from the floor level. The centerline of the mixer is at 14 ft elevation. The legs of the pedestal terminate on bearing plates to spread the load of the pug mill and ancillary equipment. The support frame is stepped down to also support the Waste Scalping Screen (SCN-4001) at a base level of 7 ft elevation. The frame module is 2 ft wide to support the mixer, but is a total width of 6 ft to support two levels of steel stairs (one 7 ft rise, the other 4 ft rise) and walkway with guard rails at the 11 ft level adjacent to the mixer. The stairs are oriented parallel to the mixer and the walkway. The walkway will permit visual observation from above the inside of the mixer and the screen deck through their plexiglass view ports.

Ancillary equipment to the Mixing/Blending System in the MBTU, Area 4000, includes: a Treated Waste Scalping Screen, Treated Waste Transport Conveyor, Fines Transfer Conveyor, Container Jockey System, Mixing/Blending Treatement Unit Control Panel and Dust Collection System for the covered handling systems. These are described below:

- The Treated Waste Scalping Screen (SCN-4001) directly receives the relatively-dry, aggregated treated waste product from the pug mill mixer discharge. The Mixing/Blending System is deliberately operated toward the dry side of the treatment envelope in order to insure that the

treated waste produced will satisfy the WAC for the OU4 placement and to prevent production of a sticky, hard-to-handle treated waste form. As a consequence it is expected that there will be some unaggregated pozzolanic material remaining in the treated waste discharging from the Mixing/Blending System.

The Treated Waste Scalping Screen (SCN-4001) is a linear screen (Sprout-Bauer) with single, 4 ft x 3 ft polyurethane screen deck (2.0 mm opening) which is fully enclosed. It has a 24 in. x 24 in. view port and is vented under negative pressure to the Dust Collection System (DCS-4001). The undersize fines fall into a V-shaped bottom hopper, and then to the Fines Transfer Conveyor (CV-4001) which transports them back to the Mixing/Blending System feed hopper via the Recycle Waste Conveyor. The oversize treated waste from the screen falls by gravity to the Treated Waste Transport Conveyor (CV-4002).

- The Fines Transfer Conveyor (CV-4001) is a slightly-elevated screw conveyor (9 in. diameter by 15 in. L) which transports any excess pozzolan fines to the Recycle Conveyor (CV-4003). The fines fall by gravity into the Recycle Conveyor which, in turn, elevates and transports the fines and any recycle waste or dust, when necessary, back to the Mixing/Blending System feed hopper. It can feed up to 500 ft^3/hour and will be adjusted to keep any recycle stream inventory to a minimum. The rigid steel shell of the conveyor is supported from the floor with steel angle section support legs with bearing plate load-spreader footings.

- The Treated Waste Transport Conveyor (CV-4002) is a totally enclosed, flexible pocket belt conveyor which receives the screen overflow treated waste and conveys it and dumps it into the Treated Waste Container (CON-5001 through CON-5012). A Camflex belt conveyor of 50 ft length (100-ft total belt length) in a "Z" configuration is used. The conveyor has a straight run (about 10 ft) horizontal with the floor, then bends and is elevated to about 12 ft in height and then bends again parallel to the floor and cantilevers out over the Treated Waste Container. The cantilevered end is supported by steel struts which rest on steel bearing plates.

  The enclosed conveyor is under negative pressure and is vented through the Dust Collection System (DCS-4001). The flexible belt is live-rubber and is 30 in. wide with 4.5 in. corrugated sidewalls and 4.5 in. H x 12 in. W pockets. It is a variable speed unit with a capacity up to 40 tph, or about twice the anticipated treated waste production rate.

  The conveyor discharges into the Treated Waste Container through a flexible, shrouded discharge chute. The end of the chute is mated with an entry opening on the "window-shade",

a movable cover on the Treated Waste Container. A dust collection pickup point is connected to the discharge chute. This results in a positive dust seal and slight negative pressure in the Treated Waste Container during waste discharge. The suction pressure in the dust collection system is controlled by butterfly dampers located in the pickup ducts from the collection points.

- The Dust Collection System (DCS-4001) consists of a multiple-folded bag filter (J. D. McSteen, Hopper Style, Model 2-150) with 1000 cfm capacity. It is equipped with a 1/3-hp vibrating motor for bag cleaning and a back-blow plenum to assist in bag cleaning by diverting the suction fan discharge into a back-flow arrangement. It comes with a 10 ft^3 rectangular cone dust storage hopper which has a slide gate discharge valve. The collector is elevated such that a 48 ft^3 standard Tote container fits under the support legs. The unit is mounted on four steel support struts and is 9 ft high to the top of the dust collection plenum and has 45 in. clearance under the cone section.

  Mounted on top of the plenum are two HEPA filters (0.50 micron) each with 1,000 cfm capacity. One is actively operating, the other is an installed spare and backup. Suction is provided by a centrifugal fan-type blower mounted on top of the dust collector plenum. It develops a minimum of 0.50 psig negative pressure and 1,000 cfm flow rate.

- The standard 48 ft^3 Tote Dust Storage Container (CON-4001) (42 in. L x 42 in. H x 48 in. W) is equipped with a flexible mating shroud to an entry port, has a passive cartridge-type vent filter for displaced air from the container during filling, and has a hatch for insertion of the Treated Waste/Dust Suction Wand which conveys the dust to the Treated Waste Recycle System.

- The Container Jockey System (JS-4001) is a two-way cable pull system which moves the unloaded and loaded roll-off Treated Waste Containers (CON-5001 through CON-5012) under the waste conveyor discharge chute such that the waste is uniformly distributed along the length of the container. It consists of an electrically-driven cable reel winch with reversing capability. Speed control is provided by a multiple sheave manually set clutch and transmission in the winch gearbox.

  The roll-off type container is off-loaded from its transport truck by sliding along rails on the truck and is suspended by the truck-mounted cable system. The container is loaded onto the Container Jockey System which consists of the guide rails and welded steel plates on which the wheels of the container are supported and rolled. The steel base plates are 8 ft x 64 ft with 60 ft of dual 4 in. I-beams which serve as the guide rails down the center line. The double-braided

steel cables run between the rails which are spaced 4 ft apart to mate up with the standard roll-off box configuration.

When a roll-off container is placed in the Container Jockey System, the transport truck rails are tilted and the truck winch cable lets the container slide onto the rails and base plate. A cable connection is made on each end of the container from the jockey winch system. The winch operates in a "pull-in" mode for moving the empty container into position. The winch direction and the cable take-up reel is reversed for movement in a "pull-out" mode for loading the container and for moving the loaded container into position for a transport truck to retrieve it. Limit switches and end barriers prevent the container from travelling too far in either direction. Appropriate safety guards and protection cages are provided to prevent accidental contact by operators with the winch reels, etc. Operation is manual with manual speed adjustment.

- A Mixer Flush Water Tank (D-4001) and automatic Mixer Flush Water Pump (P-4001) is provided to receive any Mixing/Blending System flush water and pump it back to the Sludge Feed Tank 1 (D-2001) for reuse and recycle. Flush water from the cleaning of the Mixing/Blending System is discharged into the tank through flexible, double-contained pipeline. The flushing operation is a manually-initiated and controlled operation done at the end of an operating shift, if required, during an emergency shut-down situation. The flush water slurry is discharged into double-contained flexible hose sections when pumped back to the Sludge Feed Tank.

  An existing skid module from the earlier Pond 207A/B Process Train (Module 207A/B-07) is used for this application. The 5 ft diameter x 5 ft H (575 gal.) covered carbon steel tank is mounted on a 8 ft x 8 ft containment skid. A vertical slurry pump, 200 gpm at 50 PSIG. TDH (Gallagher Model 5100) is mounted in the tank. It's ON-OFF cycle is controlled by HI and LO level automatic controls.

6.3.1.5 Area 5000: Treated Waste Storage and Transport Unit

The treated waste is discharged and stored in standard steel 30 yd^3 roll-off containers which are used as the Treated Waste Containers (CON-5001 to CON-5012). The standard container has a locking and sealed end dump gate which is used to dump the treated waste into the OU4 closure area.

The standard "window shade" flexible (i.e., rubberized canvas) electrically-actuated rolling cover has been modified to include open sections with flap covers for access to the container with the vacuum suction wand for recycle, or for analytical sampling. In addition, the cover has an opening designed for mating with the

Treated Waste Transport Conveyor discharge chute shroud to allow discharge of treated waste into a sealed container. This also allows some degree of negative pressure to be maintained during filling of the roll-off container. The section of the cover containing the openings are designed to roll up on one of the cover take-up reels which will allow an unbreached cover to be maintained on the treated waste during curing storage and during transport.

Each container has its own electrically-driven cover system. As the container is moved along the Container Jockey System during filling, the position of the fill opening in the window-shade cover is also moved to maintain a relative position under the discharge chute of the Treated Waste Transport Conveyor. This is manually-controlled by the operators during the 1 to 1.5 hours required to fill each container.

6.3.1.6 Area 6000: Treated Waste Recycle System

The treated waste sample are collected from each Treated Waste Container after curing to make sure that it satisfies the WAC for the OU4 closure area. A portable stairway is provided for access to the top of the container. In the event a batch (full container) does not satisfy the WAC, it is recycled back to the Mixing/Blending Treatment Unit. This recycle operation takes place on an off-shift and the recycled waste is not commingled with any new pond sludge feed. If the treated waste sample passes analytical testing, the waste container will be moved out of the curing area and transported to the OU4 closure area.

If the treated waste does not pass analytical testing, the container contents will be reclaimed using a similar vacuum suction system as is used for wet reclamation of the pond sludge from the interim storage tanks. This system, a Hi-Vac Model 275 with 2,400 cfm suction capacity, is mounted on top of an integral 75 ft^3 dry discharge hopper. It is located adjacent to the Mixing/Blending System and a steel-plate covered floor area where roll-off containers are staged during curing.

The Model 275 vacuum pump module is 6.1 ft W x 6.2 ft L x 5.1 ft H and weighs 5,000 lbs. The 75 ft^3 discharge hopper and stand (with rotary valve discharge) is 4.8 ft W x 6.5 ft L x 11.6 ft H. The four HEPA filters (3 operating at 1,000 cfm max. each, 1 spare) is mounted on top of the assembly. The total height of the assembly is 17.8 ft with gross loaded weight of 15,000 lbs. The whole assembly rests on four base plates, one for each support leg.

A suction wand is connected to the vacuum receiver and material for recycle is deposited into the discharge hopper at a 375-750 lbs/min rate. The material for re-treatment is discharged from the hopper using a rotary feeder (5 in. x 5 in.) into a 9 in. in diameter x 43 ft elevating Recycled Waste Screw Conveyor (CV-4003) which transport it back to the Mixing/Blending System feed hopper. This conveyor also receives the Treated

Waste Scalping Screen fines and also recycles them back to the Mixing/Blending System. The Treated Waste Recycle System is also used to suction dust from the Dust Collection System Dust Container (CON-4001) for recycle and re-treatment.

6.4 ELECTRICAL DESIGN

Electrical power will be supplied to the Pond Sludge Treatment System at 480 volts, 3 phase, 60 hertz. This power shall be provided by an outdoor pad-mounted transformer for distribution to the processing equipment, control panels, and a 240/120-volt distribution system for lighting, and receptacles. This 480 volts shall be connected by stranded copper conductor via raceway to the Main Distribution Switchboard complete with main circuit breaker and subcircuit breakers for feeding the respective operating areas. The Main Distribution Switchboard will be top fed and all branch circuits will be top connected. The ratings for the Main Distribution Switchboard will be as shown on Drawing 51309-C701 (Part III - Appendix A).

The 600-KVA main power transformer will be furnished with an exterior connection box for both primary and secondary connections. The transformer will also be provided with two secondary taps above and below the normal connection point.

From the Main Distribution Switchboard, power will be distributed to the respective areas using stranded copper conductors via raceways to unfused main disconnect switches. These switches will be mounted on local racks. The amperage rating, cable size, and number of conductors are shown on Drawing 51309-C701 (Part III - Appendix A). Connections from the unfused main disconnect switch will be made with plugs and receptacles to the vendor supplied skid mounted equipment.

The vendor-supplied skid-mounted equipment will be complete with all motor starters, control panels, secondary distribution system, lighting, and receptacles to furnish a complete operating system requiring a minimal amount of field wiring. All skid mounted equipment will be installed using the 1993 NEC, NFPA 70 and the latest federal, state, and local codes.

The control panels will be NEMA 4X and all conduit connections will be made with conduit hubs. The panels will each be furnished with a GFI type duplex receptacle and an interior switched rough service fluorescent light for maintenance and service. Terminal blocks will be provided for all external connections. All panel wiring will be clearly labeled at all connection points and placed neatly in bundles or interior wireways. Panel mounted equipment are shown on the Electrical Equipment List (Part III - Appendix B).

Motor starters will be of the type and size rated for use with the respective motor load. Starters, variable speed drives will be mounted in NEMA 4X enclosures and have no knockouts. All connections will be made utilizing hubs. Motor starters are shown on the Electrical Equipment List and on Drawings 51309-C702 through 51309-C706 (Part III - Appendix A). Final connections to all motors will be made utilizing flexible conduit connections.

All motors, panels, and equipment mounted on the skid will be grounded in accordance with the NEC Code. The skid shall be provided with two connection points for the final connection to earth ground. These ground connections will be of the locking pressure type and will not protrude or create a trip hazard.

6.5 CIVIL/STRUCTURAL DESIGN

The civil/structural design of the Pond Sludge Treatment System is based on the following site-specific design criteria:

- The integrity of the asphaltic surface of the 750 Pad, upon which the components of the Pond Sludge Treatment System will be placed, is not to be disrupted or damaged in any way by such construction activities as foundation excavations, tie-down bolt penetrations, heavy equipment gouges, etc.

- The bearing pressure placed on the 750 Pad surface by the Pond Sludge Treatment System equipment shall not exceed 1,000 lbs/ft^2 (psf) under any possible design scenario (e.g., fully loaded, high winds, seismic, etc.)

- Under the Temporary Unit (TU) design philosophy, any load spreading floors or structures used to support the Pond Sludge Treatment System should be relatively easy to assemble and disassemble.

A preliminary evaluation of the treatment system equipment skids described in the Process and Mechanical Design sections of this report indicates the following:

- Area 1000 (Sludge Removal and Transfer Unit) - The bottom support structures that will be provided with the unit's two skids will provide sufficient bearing distribution so that the 1,000 psf limit will not be exceeded.

- Area 2000 (Sludge Feed Unit) - Like Area 1000, the unit's two skids will provide sufficient load bearing distribution so that the 1,000 psf limit is not exceeded.

- Area 3000 (Treatment Additives Storage and Feed Units) - The bearing loads on the 750 Pad that will be generated by the additive storage silos will exceed the 1,000 psf limit if standard support column base plates are used. Also, the silos will be unstable under seismic and wind load conditions without a load spreading foundation that is securely fastened to the silo support columns. Therefore, a load distribution structure located next to the south side of Tent 12 will have to be constructed to support the silos. The structure will be constructed of reinforced concrete (poured on top of an impermeable barrier placed on top of the asphaltic surface), or structural steel. The structure will be designed such that it can be easily installed, and then removed when operations are completed.

- Area 4000 (Mixing/Blending Treatment Unit) - This unit, which consists principally of the pug mill mixer, scalping screen, treated waste conveyor and dust collection equipment, will be supported by modular structural frames that will transmit the unit component loads to support column base plates. The base plate bearing loads that will be transmitted to the 750 Pad will not exceed the allowable bearing limit.

- Area 5000 (Treated Waste Storage and Transport Unit) - With this unit, the main criteria of concern is the potential damage to the 750 Pad surface that may occur from the collection and deposition of roll-off containers in and near the Tent 12 area. To alleviate this concern, steel plating will be placed on the 750 Pad surface in the areas where roll-off containers will be staged.

- Area 6000 (Treated Waste Recycle Unit) - Similar to the Area 1000 unit, this unit's two skids will sufficiently distribute bearing loads so as not to exceed the allowable bearing limit.

7.0 OTHER CONSIDERATIONS

7.1 UTILITY REQUIREMENTS

The only utilities required for the operation of the Pond Sludge Treatment System are electrical power and site process water. It is projected that the treatment system will have a total connected power requirement of approximately 360 kilowatts (KW). Under normal operating conditions, the electrical power demand is expected to be 220 KW for a period of 3 to 5 hours each operating day. The demand for site process water is expected to be intermittent in batches of 100 to 500 gal at a 20 to 40 gpm flowrate.

7.2 QUALITY ASSURANCE

Quality Assurance requirements for this project are addressed in the Operational Requirements Document in Part III, Appendix G, of this report.

7.3 SECURITY

Security requirements for this project are addressed in the Operational Requirements Document in Part III, Appendix G, of this report.

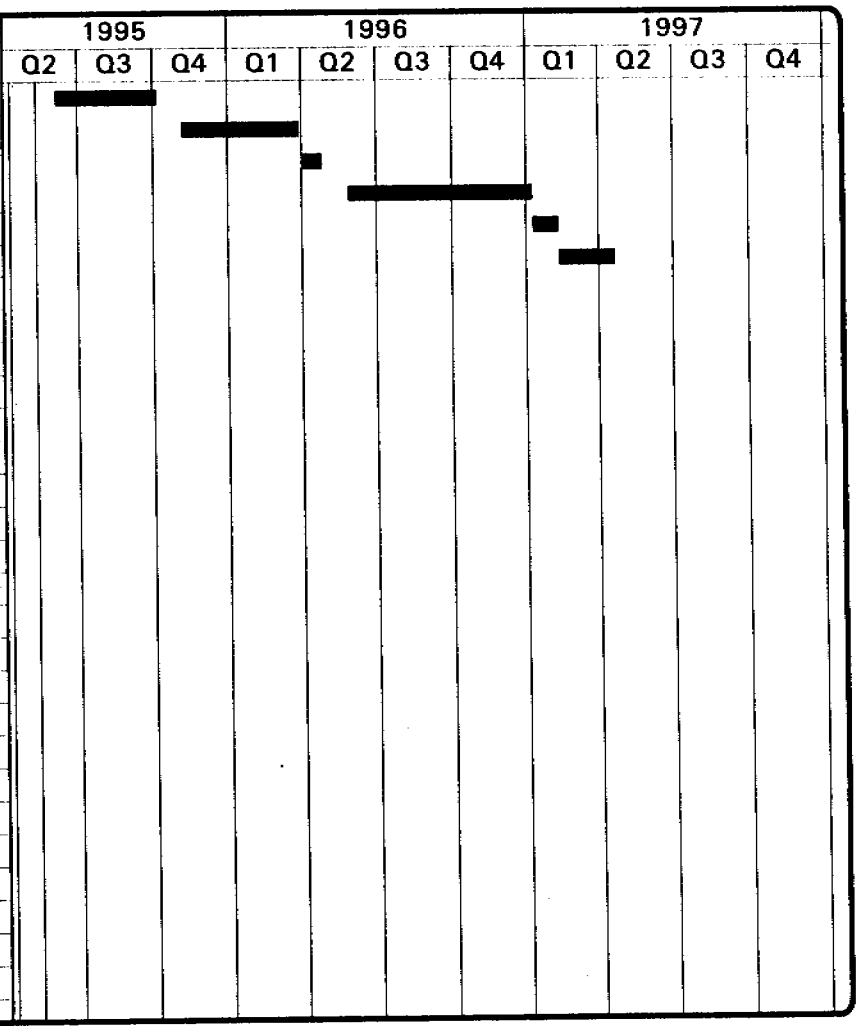
8.0 PROJECT EXECUTION

Project execution, as it pertains to this project, is addressed in the Engineering and Project Management Work Plan in Part III, Appendix H, of this report.

The schedule for this project is presented in the following Table 8-1.

TABLE 8-1
Accelerated Pond Sludge Processing Conceptual Design Report
PROJECT SCHEDULE

Row #	Task Name	Duration	Start	End
1	Title II Design	88.00 d	Jun/05/95	Oct/06/95
2	Procurement / Installation	100.00 d	Nov/06/95	Mar/29/96
3	Commissioning / Training	20.00 d	Apr/01/96	Apr/26/96
4	Treatment Operations	156.00 d	May/28/96	Jan/09/97
5	Decontamination / Dismantling	21.00 d	Jan/10/97	Feb/10/97
6	Schedule Reserve	49.00 d	Feb/11/97	Apr/21/97



9.0 COST ESTIMATE

The preliminary cost estimates for the Pond Sludge Treatment System are as follows:

Procurement and Installation (Capital Cost))	$3,100,000
Operations and Maintenance Costs	$5,600,000
Decontamination and Dismantling Costs	$350,000

For a detailed breakdown of the above cost estimates, see Part III - Appendix D, of this report.

039520/P

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
SOLAR POND PROJECTS

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

PART II - PROJECT MANAGEMENT

CONTRACT NO. 225471001/ST3

PREPARED FOR

EG&G ROCKY FLATS, INC.
GOLDEN, COLORADO

PREPARED BY

HALLIBURTON NUS CORPORATION
PITTSBURGH, PENNSYLVANIA

JUNE 7, 1995

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

PART II - PROJECT MANAGEMENT

TABLE OF CONTENTS

SECTION PAGE

039520/P

ROCKY FLAT
SOLAR POND PROJECTS

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

PART III - SUPPLEMENTAL INFORMATION

CONTRACT NO. 225471001/ST3

PREPARED FOR

EG&G ROCKY FLATS, INC.
GOLDEN, COLORADO

PREPARED BY

HALLIBURTON NUS CORPORATION
PITTSBURGH, PENNSYLVANIA

JUNE 7, 1995

ACCELERATED POND SLUDGE PROCESSING
FINAL CONCEPTUAL DESIGN REPORT

PART III - SUPPLEMENTAL INFORMATION

TABLE OF CONTENTS

APPENDICES

A	DRAWINGS
B	EQUIPMENT LIST
C	DESIGN BASIS DATA
D	DETAILED COST ESTIMATE
E	GES SCREEN
F	SYSTEM CLASSIFICATION FORM
G	OPERATIONAL REQUIREMENTS DOCUMENT
H	ENGINEERING AND PROJECT MANAGEMENT WORK PLAN

PART III

APPENDIX A

DRAWINGS

PART III

APPENDIX B

EQUIPMENT LIST

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST

AREA 1000: SLUDGE REMOVAL AND TRANSFER UNIT (SRTU)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
VTS-1001	Sludge Removal System	1	Self-contained mobile wet-dry vacuum system equipped with: - One 3,000 cfm @ 15" Hg vacuum pump with 500 to 1000 lbs/min handling capacity - One 100 ft^3, 60° cone-bottomed discharge hopper with bottom slide-gate isolation valve - One manually-operated discharge control valve (pinch) - One HEPA filter on vacuum pump discharge	Hi-Vac Model 2100, with 100 ft^3 cone-bottomed intercept hopper, slide-gate and discharge control valve. Equipped with four 24" x 24" x 12", 1000 cfm HEPA filter elements, three operating, one standby.	100	New Purchase
P-1001	Sludge Transfer Pump	1	Progressive-cavity, positive-displacement pump. Manually-adjustable variable-speed (V.S.) drive, 0-50 gpm @ 100 psig discharge pressure.	MOYNO 365-CDQ-AAA Variable-speed (V.S.) drive 0-50 gpm @ 100 psig, TEFC motor	7.5	Existing Former 430-P-03 on Module No. 207A/B-06
P-1002	Flush System Submerged Pump	1	Submersible trash/slurry pump 200 gpm @ 50' head. Equipped with cage stand inlet with flush system submerged pump NEMA 4X Control Station.	Grindex Submersible Trash Pump, Model Salvador, 3" NPS discharge, 60 lbs. wt., TEFC motor.	2.5	New Purchase
PIP-1001	Cross-Country Transfer Piping - 2"	20	2" reinforced rubber hose in 100-ft sections HP 316SS Kamlock M&F connectors			New Purchase
PIP-1002	Vacuum-Suction Transfer Piping - 4"	8	4" suction hose in 50-ft sections Kamlock M&F connectors			New Purchase
PIP-1003	Containment Piping - 4"	10	4" collapsible fire hose in 100-ft sections M&F locking collar connectors			New Purchase
SP-1001	Sludge Suction Wand	2	4" Suction head (Hi-Vac) with suction control			New Purchase
SP-1002	Flush System Wand	2	2" NPS PVC/Rubber hose wand with manual control valve			New Purchase

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST - PAGE TWO

AREA 1000: SLUDGE REMOVAL AND TRANSFER UNIT (SRTU) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
CON-1001	Oversized Waste Container	1	Covered dumpster metal container	4'W x 7.5'L x 4'H 120 ft^3 capacity		Existing
LFT-1001	Man Lift	1	Hydraulic gondola or scissor-jack type man lift with working platform large enough for two people and 1000 lbs lifting capacity. Mobile or transportable by fork lift.		10	New Purchase
FIS-1001	Sludge Transfer Flow Indicating System	1	Flow monitoring system, including: - One in-line en-masse flow-measuring element - One pipe-mounted flow transmitter - One panel-mounted flow indicator	Micromotion, 316L, 2" NPS	1 equivalent	Existing former FIT-115
MIS-1001	Sludge Transfer Mass Indicating System	1	Pond sludge TSS concentration monitoring system, including: - One in-line TSS-measuring element - One pipe-mounted transmitter - One panel-mounted TSS concentration indicator	McNab Turbidimeter, 2" NPS	1 equivalent	Existing PNDIS #14-05
LCS-1001	Sludge Removal Level Control System	1	Level control system for VTS-1001 discharge hopper. System includes: - One hopper-mounted ultrasonic level measuring element - One local level transmitter - One panel-mounted level indicator-controller with HI and LO level switches and alarms		1 equivalent	New Purchase

AREA 1000: SLUDGE REMOVAL AND TRANSFER UNIT (SRTU) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model Etc.	Installed Power (HP)	Status
CP-1001	Sludge Removal and Transfer Unit Control Panel	1	Unit-mounted NEMA 4X enclosure with face-mounted instruments and controls, front-mounted access door. Includes - Sludge flow indicator (gpm) - Sludge suspended solids concentration indicator (%) - Level indicator for VTS-1001 discharge hopper - HAND-OFF-AUTO switches for VTS-1001 vacuum pump and P-1001 - V.S. controller and speed indicator for P-1001 - HI-LO level alarms for VTS-1001 discharge hopper - Running lights for electric motors - Emergency System-wide shut-down button for all equipment		3 Equivalent	New Purchase

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST - PAGE FOUR

AREA 2000: SLUDGE FEED UNIT (SFU)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
D-2001 D-2002	Sludge Feed Tanks	2	Vertical, cylindrical, cone bottomed, closed-top tank, 10' ϕ x 4' H cylinder x 4'-8' cone bottom (40°) with 2,700 gallon capacity. Equipped with free-standing channel bridge support for agitator. Four baffles on inside cone side walls (6" x 4') are provided to facilitate slurry suspension.			Two new tanks. One on existing Module No. 207A/B-07, and one on new module
D-2003	Process Water Tank	1	Vertical cylindrical, covered tank 8' ϕ x 9' H with approximately 2,700 gallon capacity. Modified side entry port and adjusted high-level control. Side mounted heating panels and integrated temperature control system to permit modest temperature elevation (to 35-40°C)	50 Kw heating panels	70 equivalent	Existing Tank 430-S-06 on Module No. 207A/B-07 modified as required[1]
A-2001 A-2002	Sludge Feed Tank Mixers	2	Top-mounted on bridge above D-2001 and D-2002. Will need longer impeller shaft and bridge support.	Burnhams Sharp XLG-500 mixer with Lightnin A-310 pumping impeller 2 ft diameter. V.S. drive.	7.5 (each)	One Existing Agitator 430-A-01 Formerly mounted on tank 430-SU-01 on Module No. 207A/B-C2. One new agitator
P-2001 P-2002	Sludge Feed Pumps	2	Progressive cavity, positive-displacement pump, V.S. drive, 50 psig, 0-40 gpm.	MOYNO 2E012G1-CDQ-HSA, TEFC motor	5 (each)	One Existing Pump 430-P-05 on existing Module No. 207A/B-07. One new pump on new module
P-2003	Process Water Pump	1	Horizontal centrifugal pump with 200 gpm capacity @ 112 psig discharge pressure.	4" X 3" Wilfley Model AG pump, TEFC motor	40	Existing Pump 430-P-06 on Module No. 207A/B-07

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST - PAGE FIVE

AREA 2000: SLUDGE FEED UNIT (SFU) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
P-2004	Flush Water Pump	1	Horizontal centrifugal pump with 150 gpm capacity @ 50 psig discharge pressure.	3" x 2" Wilfley Model AG pump, TEFC motor	20	Existing Pump 430-P-02 on Module No 207A/B-07[1]
P-2005 P-2006	Decant Pumps	2	Self-priming horizontal centrifugal slurry pumps with 90 gpm capacity at 20' psig 1-1/2" discharge. TEFC motor.	Teel self-priming pump Model 2P374, TEFC motor	1.5 (each)	New Purchase[1]
FCS-2001	Sludge Feed Flow Control System	1	Pond sludge flow monitoring system, including: - One in-line en-masse flow-measuring element - One pipe-mounted flow transmitter - One panel-mounted flow rate indicator with input to MBTU logic controller	Micromotion, 316L, 2" NPS	1 equivalent	Existing Former FIT-221
MCS-2001	Sludge Feed Mass Control System	1	Pond sludge TSS concentration monitoring system, including: - One in-line TSS-measuring element - One pipe-mounted transmitter One panel-mounted TSS concentration indicator with input to MBTU logic controller	McNab Turbidimeter, 2" NPS	1 equivalent	Existing HNUS #14-05
CCS-2001	Sludge Feed Conductivity Control System	1	Pond sludge TDS concentration monitoring system, including: - One in-line TDS-measuring element - One pipe-mounted transmitter - One panel-mounted TDS concentration indicator with input to MBTU logic controller	Signet conductivity cell, Model F/05660-22, Analog analyzer, indicator.	1 equivalent	Existing HNUS #14 12

AREA 2000: SLUDGE FEED UNIT (SFU) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
LCS-2001 LCS-2002	Sludge Feed Level Control Systems	2	Level control systems for D-2001 and D-2002. Each system includes: - One tank-mounted ultrasonic level measuring element - One local level transmitter - One panel-mounted level indicator-controller with HI and LO level switches and alarms		1 equivalent (each)	New Purchases[1]
LCS-2003	Process Water Level Control System	1	Level control systems for D-2003. Each system includes: - One tank-mounted resistivity-type level measuring element - One local level transmitter - One panel mounted level indicator-controller with HI and LO level switches and alarms		1 equivalent (each)	New Purchases[1]
CP-2001	Sludge Feed Unit Control Panel	1	Unit-mounted NEMA 4X enclosure with face-mounted instruments and controls, front-mounted access door. Includes: - Sludge flow indicator (gpm) - Sludge TSS concentration indicator (%) - Sludge TDS concentration indicator (%) - Level indicators for D-2001, D-2002, and D-2003 - HAND-OFF-AUTO switches for A-2001, A-2002, P-2001, P-2002, P-2003, and P-2004 - V.S. drive controls and speed indicators for A-2001, A-2002, P-2001 and P-2002 - HI LO level alarms for D-2001, D-2002 and D-2003 - Running lights for electric motors - Emergency system-wide shut down button for all equipment		3 equivalent	New Purchase[1]

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST - PAGE SEVEN

AREA 3000: TREATMENT ADDITIVES STORAGE AND FEED UNITS (ASFUs)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model Etc.	Installed Power (HP)	Status
SL-3001 SL-3002	Pozzolanic Reagent Storage Silos	2	Silos are vertical, cylindrical, closed-top, cone-bottomed (60°) tanks. Fill connections equipped with quick-connect fittings. Bottom discharge equipped with knife-gate valves. Live-bottom mechanisms to prevent bridging. Passive emission control system with top-mounted baghouse type filter.	12.0' φ x 24.0' SSH + 60° cone 100 cubic yards, 86 tons capacity		New Purchase or lease[1]
SL-3003	Hydrated Lime Storage Silo	1	Silo is a vertical, cylindrical, closed-top, cone-bottomed (60°) tank. Top fill connection equipped with quick-connect fittings. Bottom discharge connection equipped with knife-gate valves. Live-bottom mechanisms to prevent bridging. Passive dust emission control system with top-mounted baghouse type filter.	10.0' φ x 14.75' SSH + 60° cone 40 cubic yards, 35 tons capacity		New Purchase or lease[1]
AFS-3001 AFS-3002	Pozzolanic Reagent Additive Feed Systems	2	Systems consist of: - One V.S. rotary valve feeder - Weigh-belt for bulk reagent with 2' x 7' measurement section, scale electronics with local and remote display of rate, V.S. drive - Horizontal, rigid, V.S. screw conveyor	12" x 12" Rotary valve prefeeder with V.S. drive 2' x 7' with V.S. 0-30 tph capacity Merrick Model 455 9' φ x 20' L, carbon steel screw conveyor, V.S. drive, 0-30 tph capacity	3 (each) 0.5 (each) 5 (each)	New Purchase or lease[1]

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST - PAGE EIGHT

AREA 3000: TREATMENT ADDITIVES STORAGE AND FEED UNITS (ASFUs) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
AFS-3003	Hydrated Lime Additive Feed System	1	System consists of: - One V.S. rotary valve feeder	8" x 8" Rotary valve prefeeder with V.S. drive	3	New Purchase or lease[1]
			- Weigh-belt for bulk reagent with 2' x 7' measurement section, scale electronics with local and remote display of rate V.S. drive	2'W x 7'L with V.S. 0-30 tph capacity Merrick Model 455	0.5	
			- Elevated, rigid, V.S. cross-country screw conveyor	9'D x 40'L, 30° rise angle, carbon steel screw conveyor, V.S. drive, 0-30 tph capacity	5	
LCS-3001 LCS-3002 LCS-3003	Storage Silos Level Control Systems	3	Level control systems for SL-3001, SL-3002, and SL-3003. Each system includes: - One silo-mounted ultrasonic level-measuring element - One local level transmitter - One panel-mounted level indicator controller with HI and LO level switches and alarms		1 equivalent (each)	New Purchase[1]

AREA 3000: TREATMENT ADDITIVES STORAGE AND FEED UNITS (ASFUs) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
CP-3001 CP-3002 CP-3003	Additive Feed Unit Control Panels	3	Unit-mounted NEMA 4X enclosure with face-mounted instruments and controls, front-mounted access door. Includes: - Level indicator for storage silo - HAND-OFF-AUTO switches for rotary valve feeder, weight belt conveyor, and screw conveyor - V.S. controllers and speed indicators for rotary valve feeder, weight belt conveyor and screw conveyor - HI-LO level alarms for storage silos - Running lights for electric motors - Emergency system-wide shut down button for all equipment		3 Equivalent (each)	New Purchase[1]

AREA 4000: MIXING/BLENDING TREATMENT UNIT (MBTU)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
MBS-4001	Mixing Blending System	1	Twin-shaft V.S. drive, covered pug mill with enclosed conical feed hopper. Pumping paddles, adjustable manual discharge slide-gate valve	Nominal 20 tph product rate. (0-30 tph range). 21'W x 8'L size. (Sprout-Bauer)	60	New Purchase[1]
SCN-4001	Treated Waste Scalping Screen	1	Covered vibrating scalping screen with slotted polyurethane deck and high-frequency linear drive	Sprout-Bauer 4' x 8' linear shaking screen with 2.0 mm size opening for dry screening.	3	New Purchase[1]
CV-4001	Fines Transfer Conveyor	1	V.S. screw conveyor	9' ϕ x 40'L, carbon steel screw conveyor, V.S. drive, 0-40 tph capacity	5	New Purchase[1]
CV-4002	Treated Waste Transport Conveyor	1	Flexible pocket belt conveyor. V.S. drive with cover and shrouded discharge chute.	30'W x 50'L with 4.5'H x 12'W pocket segments. Manual V.S. drive, 0-40 tph capacity. Cambelt Model CWR3045 12	5	New Purchase[1]
CV-4003	Recycle Conveyor	1	V.S. elevating screw conveyor	9' ϕ x 43'L, carbon steel screw conveyor, V.S. drive 0-40 tph capacity	5	New Purchase[1]
JS-4001	Container Jockey System	1	Two-way jockey cable-pull to spread treated waste evenly throughout the waste container. Has electric cable winch system, rigid frame and integral tracks for guiding container with travel limit stops.	Winch by Winches, Inc., rigid frame and support base for 30 ton load	25	New Purchase[1]
D-4001	Mixer Flush Water Tank	1	Skid-mounted tank which receives flush water and solids from mixer/blender flushing. Equipped with a vertical slurry sump pump and HI-LO level switches.	5' ϕ x 5' H C.S. tank with vertical sump pump 575 gallon capacity.		Existing Tank[1] 430 SJ 02 mounted on existing skid No 207A-B-07

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST - PAGE ELEVEN

AREA 4000: MIXING/BLENDING TREATMENT UNIT (MBTU) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model Etc.	Installed Power (HP)	Status
P-4001	Mixer Flush Water Pump	1	Vertical centrifugal slurry pump	3 D x 60 L vertical centrifugal slurry pump, Gallagher Model 5100, 200 gpm @ 50 psig head, TEFC motor	25	Existing Tank[1] 430-B-07 mounted on existing skid No. 207A-B-07
DCS-4001	Dust Collection System	1	System includes: - Dust collection ductwork - Dry-type baghouse - HEPA Filter - Exhaust blower system uses exhaust blower low-pressure air for back-blow of filter leafs	- 6" OA4 ridged steel duct work - Dust Vent Model 2-150 multiple-fold fabric filter collector, 37"L x 28"W x 31"H with 24" cone-bottom hopper with slide-gate valve, 8.4 ft^3 active capacity. Equipped with shaking motor and low-pressure back-blow - Dual 24" x 24" x 12" HEPA filters, 0.5 micron openings, one operating, one spare, 1000 cfm capacity - 1000 cfm exhaust blower @ 0.5 psig discharge pressure	3 10	New Purchase[1] or Lease
CON-4001	Dust Container	1	Dust holding bin with passive vent filter	Tote 42" L x 48" W x 42" H 48 ft^3 capacity		New Purchase[1]
LCS-4001	Mixer Flush Level Control System	1	Level control for D-4001. System includes: - One tank-mounted resistivity level-measuring element - One local level transmitter - One panel-mounted level indicator-controller with HI and LO level switches and alarms		1 equivalent	New Purchase[1]

AREA 4000: MIXING/BLENDING TREATMENT UNIT (MBTU) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
CP-4001	Mixing/Blending Treatment Unit Control Panel	1	Unit-mounted NEMA 4X enclosure with face-mounted instruments, controls and front-access door. Panel to include: Feed rate (weight) indicators for all components being fed to MBS-4001. Includes: Sludge flow rate, pozzolan mix feed rate hydrated lime, and computed free water feed rate - Logic controller output for mix control setting linked with AFS-3001, AFS-3002 and AFS-3003 with HAND-OFF-AUTO rate control settings - HAND-OFF-AUTO switch for JS-4001 - ON-OFF switches for MBS-4001, SCN-4001, CV-4001 CV-4002, CV-4003 and DCS-4001 exhaust blower and bag vibrator motor - V.S. drive controls and speed indicators for MBS-4001, CV-4001, CV-4002, and CV-4003 conveyors - Level indicator for D-4001 - HI and LO level alarms for D-4001 - Running lights for the electric motors - Emergency system-wide shutdown button for all equipment		3 Equivalent	New Purchase[1]

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST - PAGE THIRTEEN

AREA 5000: TREATED WASTE STORAGE AND TRANSPORT UNIT (TSTU)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc	Installed Power (HP)	Status
CON-5001 to CON-5012	Treated Waste Containers	12	Roll-off type containers with removable top cover (window-shade, double-reel type), end-dump gate and bottom wheels for jockey system tracks.	Nominal 30 yd^3, standard steel roll-off container. Approximate dimensions: 6'2"H x 8'0"W x 23'0"L. Will hold approximately 22 yd^3.		New Purchase

RFETS
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN REPORT
EQUIPMENT LIST - PAGE FOURTEEN

AREA 6000: TREATED WASTE RECYCLE UNIT (TWRU)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model, Etc.	Installed Power (HP)	Status
VTS-6001	Treated Waste Recycle System	1	Self-contained mobile wet-dry type vacuum system including: - One 2,400 cfm @ 15" Hg vacuum pump with 375 to 750 lbs/min handling capacity - One 75 ft^3 60° cone-bottom hopper with rotary-valve airlock One 5' dia. rotary valve feeder with V.S. drive, manually adjustable - Three HEPA filters on vacuum pump discharge	- HI-Vac Model 275 mobile vacuum system - 75 ft^3 hopper - Rotolok 5' x 5' - Three 24" x 24" x 12" HEPA filters, 0.5 micron, 1000 cfm capacity each	40 5	Existing[1]
PIP-6001	Treated Waste Suction Piping	4	4" suction hose in 50 ft sections HP 316SS Kamlock M&F connectors	4" NPS - HI-Vac Hose		New Purchase[1]
SP-6001	Treated Waste/Dust Suction Wand	1	Semi-hard rubber wand equipped with manual pinch control valve	4" NPS HI-VAC Hose		New Purchase[1]
LIS-6001	Treated Waste Recycle Level Indicating System	1	Level indicating system for VTS-6001 discharge hopper. System includes: - One hopper-mounted ultrasonic level-measuring element - One local level transmitter - One panel-mounted level indicator-controller with HI and LO level switches and alarms		1 equivalent	New Purchase[1]

AREA 6000: TREATED WASTE RECYCLE UNIT (TWRU) (Continued)

Item Number	Equipment Name	Number Required	Equipment Description	Equipment Size/Model Etc.	Installed Power (HP)	Status
CP-6001	Treated Waste Recycle Unit Control Panel		Unit-mounted NEMA 4X enclosure with face-mounted instruments and controls, front-mounted access door. Includes: - V.S. controller and indicator for rotary feeder - ON-OFF switches for vacuum pump and rotary valve feeder - Running lights for electric motors - Level indicator for VTS-6001 discharge hopper - HI-LO level alarms for VTS-6001 discharge hopper - Emergency system-wide shut down button for all equipment		3 Equivalent	New Purchase

[1] Also required for Pondcrete processing

ELECTRICAL EQUIPMENT
AREA 1000

MOTORS

1) SLUDGE TRANSFER PUMP (P-1001) 7.5 HP, TEFC MOTOR
2) FLUSH SYSTEM SUBMERGED PUMP (P-1002) 2.5 HP, TEFC MOTOR
3) SLUDGE REMOVAL SYSTEM VACUUM PUMP (VTS- 1001) 100 HP, TEFC MOTOR

PANEL MOUNTED EQUIPMENT

1) SLUDGE TRANSFER PUMP HAND SWITCH (ON-OFF) HS-102
2) SLUDGE TRANSFER PUMP MANUAL SPEED INDICATING CONTROLLER SIC-102
3) SLUDGE TRANSFER PUMP RUN INDICATION LIGHT (RED)
4) VACUUM PUMP HAND SWITCH (ON-OFF) HS-101
5) VACUUM PUMP RUN INDICATION LIGHT (RED)
6) DISCHARGE HOPPER LEVEL INDICATING CONTROLLER LIC-101
7) DISCHARGE HOPPER LEVEL ALARM LOW LAL-101
8) DISCHARGE HOPPER LEVEL ALARM HIGH LAH-101
9) DISCHARGE HOPPER LEVEL SWITCH LOW LSL-101
10) DISCHARGE HOPPER LEVEL SWITCH HIGH LSH-101
11) SLUDGE TRANSFER FLOW SYSTEM FLOW INDICATOR FI- 105
12) SLUDGE TRANSFER FLOW SYSTEM MOISTURE INDICATOR MI- 104
13) EMERGENCY STOP PUSHBUTTON

ELECTRICAL EQUIPMENT
AREA 2000

MOTORS

1) SLUDGE FEED TANK NO. 1 MIXER (A-2001) 7.5 HP, TEFC MOTOR
2) SLUDGE FEED TANK NO. 2 MIXER (A-2002) 7.5 HP, TEFC MOTOR
3) SLUDGE FEED TANK NO. 1 FEED PUMP (P-2001) 5 HP VARIABLE SPEED, TEFC MOTOR
4) SLUDGE FEED TANK NO. 2 FEED PUMP (P-2002) 5 HP VARIABLE SPEED, TEFC MOTOR
5) PROCESS WATER PUMP (P-2003) 40 HP, TEFC MOTOR
6) FLUSH WATER PUMP (P-2004) 20 HP, TEFC MOTOR
7) SLUDGE FEED TANK NO. 1 DECANT PUMP (P-2005) 1.5 HP, TEFC MOTOR
8) SLUDGE FEED TANK NO. 2 DECANT PUMP (P-2006) 1.5 HP, TEFC MOTOR

PANEL MOUNTED EQUIPMENT

1) SLUDGE FEED TANK NO. 1 MIXER HAND SWITCH (HAND-OFF-AUTO) HS-207
2) SLUDGE FEED TANK NO. 2 MIXER HAND SWITCH (HAND-OFF-AUTO) HS-213
3) SLUDGE FEED TANK NO. 1 FEED PUMP HAND SWITCH (HAND-OFF-AUTO) HS-210
4) SLUDGE FEED TANK NO. 2 FEED PUMP HAND SWITCH (HAND-OFF-AUTO) HS-216
5) PROCESS WATER PUMP HAND SWITCH (HAND-OFF-AUTO) HS-204

6) FLUSH WATER PUMP HAND SWITCH (HAND-OFF-AUTO) HS-206
7) SLUDGE FEED TANK NO. 1 DECANT PUMP HAND SWITCH (ON-OFF) HS-208
8) SLUDGE FEED TANK NO. 2 DECANT PUMP HAND SWITCH (ON-OFF) HS-214
9) SLUDGE FEED TANK NO. 1 MIXER RUN INDICATION LIGHT (RED)
10) SLUDGE FEED TANK NO. 2 MIXER RUN INDICATION LIGHT (RED)
11) SLUDGE FEED TANK NO. 1 FEED PUMP RUN INDICATION LIGHT (RED)
12) SLUDGE FEED TANK NO. 2 FEED PUMP RUN INDICATION LIGHT (RED)
13) PROCESS WATER PUMP RUN INDICATION LIGHT (RED)
14) FLUSH WATER PUMP RUN INDICATION LIGHT (RED)
15) SLUDGE FEED TANK NO. 1 DECANT PUMP RUN INDICATION LIGHT (RED)
16) SLUDGE FEED TANK NO. 2 DECANT PUMP RUN INDICATION LIGHT (RED)
17) SLUDGE FEED TANK NO. 1 MIXER RUN SPEED INDICATING CONTROLLER SIC-207
18) SLUDGE FEED TANK NO. 2 MIXER RUN SPEED INDICATING CONTROLLER SIC-213
19) SLUDGE FEED TANK NO. 1 FEED PUMP SPEED INDICATING CONTROLLER SIC-210
20) SLUDGE FEED TANK NO. 2 FEED PUMP SPEED INDICATING CONTROLLER SIC-216
21) SLUDGE FEED TANK NO. 1 LEVEL INDICATING CONTROLLER LIC-209
22) SLUDGE FEED TANK NO. 1 LOW LEVEL SWITCH LSL-209
23) SLUDGE FEED TANK NO. 1 HIGH LEVEL SWITCH LSH-209
24) SLUDGE FEED TANK NO. 1 LOW LEVEL ALARM LAL-209
25) SLUDGE FEED TANK NO. 1 HIGH LEVEL ALARM LAH-209
26) SLUDGE FEED TANK NO. 2 INDICATING CONTROLLER LIC-215
27) SLUDGE FEED TANK NO. 2 LOW LEVEL SWITCH LSL-215
28) SLUDGE FEED TANK NO. 2 HIGH LEVEL SWITCH LSH-215
29) SLUDGE FEED TANK NO. 2 LOW LEVEL ALARM LAL-215
30) SLUDGE FEED TANK NO. 2 HIGH LEVEL ALARM LAH-215
31) PROCESS WATER TANK LEVEL INDICATOR LIC-202
32) PROCESS WATER TANK LOW LEVEL SWITCH LSL-202
33) PROCESS WATER TANK HIGH LEVEL SWITCH LSH-202
34) PROCESS WATER TANK LOW LEVEL ALARM LAL-202
35) PROCESS WATER TANK HIGH LEVEL ALARM LAH-202
36) PONDSLUDGE FLOW INDICATING CONTROLLER FIC-221
37) PONDSLUDGE MOISTURE INDICATING CONTROLLER MIC-219
38) PONDSLUDGE CONDUCTIVITY INDICATING CONTROLLER CIC-220
39) EMERGENCY STOP PUSHBUTTON
40) PLC REMOTE RACK

ELECTRICAL EQUIPMENT
AREA 3000

MOTORS

1) POZZOLANIC REAGENT STORAGE SILO NO. 1 ROTARY FEED VALVE 3 HP VAR SPEED, TEFC MOTOR
2) POZZOLANIC REAGENT STORAGE SILO NO. 1 WEIGH BELT CONVEYOR 0.5 HP VAR SPEED, TEFC MOTOR
3) POZZOLANIC REAGENT STORAGE SILO NO. 1 SCREW CONVEYOR 5 HP VAR SPEED, TEFC MOTOR

4) POZZOLANIC REAGENT STORAGE SILO NO. 2 ROTARY FEED VALVE 3 HP VAR SPEED, TEFC MOTOR
5) POZZOLANIC REAGENT STORAGE SILO NO. 2 WEIGH BELT CONVEYOR 0.5 HP VAR SPEED, TEFC MOTOR
6) POZZOLANIC REAGENT STORAGE SILO NO. 2 SCREW CONVEYOR 5 HP VAR SPEED, TEFC MOTOR
7) HYDRATED LIME STORAGE SILO ROTARY FEED VALVE 3 HP VAR SPEED, TEFC MOTOR
8) HYDRATED LIME STORAGE SILO WEIGH BELT CONVEYOR 0.5 HP VAR SPEED, TEFC MOTOR
9) REAGENT SCREW CONVEYOR 5 HP VAR SPEED, TEFC MOTOR

PANEL MOUNTED EQUIPMENT

1) POZZO REAGENT STOR SILO NO. 1 ROTARY FEED VALVE (HAND-OFF-AUTO) HS-303
2) POZZO REAGENT STOR SILO NO. 1 WEIGH BELT CONVEY (HAND-OFF-AUTO) HS-304
3) PQZZO REAGENT STOR SILO NO. 1 SCREW CONVEYOR (HAND-OFF-AUTO) HS-306
4) POZZO REAGENT STOR SILO NO. 2 ROTARY FEED VALVE (HAND-OFF-AUTO) HS-316
5) POZZO REAGENT STOR SILO NO. 2 WEIGH BELT CONVEY (HAND-OFF-AUTO) HS-317
6) POZZO REAGENT STOR SILO NO. 2 SCREW CONVEYOR (HAND-OFF-AUTO) HS-318
7) HYDRATED LIME STORAGE SILO ROTARY FEED VALVE (HAND-OFF-AUTO) HS-310
8) HYDRATED LIME STORAGE SILO WEIGH BELT CONVEY (HAND-OFF-AUTO) HS-311
9) HYDRATED LIME STORAGE SILO SCREW CONVEYOR (HAND-OFF-AUTO) HS-312
10) POZZO REAGENT STOR SILO NO. 1 ROTARY FEED VALVE INDICATING LGT (RED)
11) POZZO REAGENT STOR SILO NO. 1 WEIGH BELT CONVEY INDICATING LGT (RED)
12) POZZO REAGENT STOR SILO NO. 1 SCREW CONVEYOR INDICATING LGT (RED)
13) POZZO REAGENT STOR SILO NO. 2 ROTARY FEED VALVE INDICATING LGT (RED)
14) POZZO REAGENT STOR SILO NO. 2 WEIGH BELT CONVEY INDICATING LGT (RED)
15) POZZO REAGENT STOR SILO NO. 2 SCREW CONVEYOR INDICATING LGT (RED)
16) HYDRATED LIME STORAGE SILO ROTARY FEED VALVE INDICATING LGT (RED)
17) HYDRATED LIME STORAGE SILO WEIGH BELT CONVEY INDICATING LGT (RED)
18) HYDRATED LIME STORAGE SILO SCREW CONVEYOR INDICATING LGT (RED)
19) POZZO REAGENT STOR SILO NO. 1 ROTARY FEED VALVE SPEED IND CONT SIC-303
20) POZZO REAGENT STOR SILO NO. 1 WEIGH BELT CONVEY SPEED IND CONT SIC-304
21) POZZO REAGENT STOR SILO NO. 1 SCREW CONVEYOR SPEED IND CONT SIC-306
22) POZZO REAGENT STOR SILO NO. 2 ROTARY FEED VALVE SPEED IND CONT SIC-316
23) POZZO REAGENT STOR SILO NO. 2 WEIGH BELT CONVEY SPEED IND CONT SIC-317
24) POZZO REAGENT STOR SILO NO. 2 SCREW CONVEYOR SPEED IND CONT SIC-318
25) HYDRATED LIME STORAGE SILO ROTARY FEED VALVE SPEED IND CONT SIC-310
26) HYDRATED LIME STORAGE SILO WEIGH BELT CONVEY SPEED IND CONT SIC-311
27) HYDRATED LIME STORAGE SILO SCREW CONVEYOR SPEED INDICATING CONTROLLER SIC-312
28) POZZO REAGENT STOR SILO NO. 1 LEVEL INDICATING CONTROLLER LIC-301
29) POZZO REAGENT STOR SILO NO. 1 LEVEL SWITCH LOW LSL-301
30) POZZO REAGENT STOR SILO NO. 1 LEVEL SWITCH HIGH LSH-301
31) POZZO REAGENT STOR SILO NO. 1 LEVEL ALARM LOW LAL-301
32) POZZO REAGENT STOR SILO NO. 1 LEVEL ALARM HIGH LAH-301
33) POZZO REAGENT STOR SILO NO. 2 LEVEL INDICATING CONTROLLER LIC-314
34) POZZO REAGENT STOR SILO NO. 2 LEVEL SWITCH LOW LSL-314
35) POZZO REAGENT STOR SILO NO. 2 LEVEL SWITCH HIGH LSH-314
36) POZZO REAGENT STOR SILO NO. 2 LEVEL ALARM LOW LAL-314
37) POZZO REAGENT STOR SILO NO. 2 LEVEL ALARM HIGH LAH-314

38) HYDRATED LIME STORAGE SILO LEVEL INDICATING CONTROLLER LIC-308
39) HYDRATED LIME STORAGE SILO LEVEL SWITCH LOW LSL-308
40) HYDRATED LIME STORAGE SILO LEVEL SWITCH HIGH LSH-308
41) HYDRATED LIME STORAGE SILO LEVEL ALARM LOW LAL-308
42) HYDRATED LIME STORAGE SILO LEVEL ALARM HIGH LAH-308
43) POZZO REAGENT STOR SILO NO. 1 LIVE BOTTOM HAND SW (ON-OFF) HS-302
44) POZZO REAGENT STOR SILO NO. 2 LIVE BOTTOM HAND SW (ON-OFF) HS-315
45) HYDRATED LIME STOR SILO LIVE BOTTOM HAND SW (ON-OFF) HS-309
46) POZZO REAGENT STOR SILO NO. 1 LIVE BOTTOM INDICATING LIGHT (RED)
47) POZZO REAGENT STOR SILO NO. 2 LIVE BOTTOM INDICATING LIGHT (RED)
48) HYDRATED LIME STOR SILO LIVE BOTTOM INDICATING LIGHT (RED)9
49) EMERGENCY STOP PUSHBUTTON
50) PLC REMOTE RACK

ELECTRICAL EQUIPMENT
AREA 4000

MOTORS

1) MIXING/BLENDING SYSTEM PUG MILL (MBS-4001) 60 HP, TEFC MOTOR
2) TREATED WASTE SCALPING SCREEN (SCN-4001) 3.1 HP, TEFC MOTOR
3) FINES TRANSFER CONVEYOR (CV-4001) 5 HP VARIABLE SPEED, TEFC MOTOR
4) TREATED WASTE TRANSPORT CONVEYOR (CV-4002) 5 HP, TEFC MOTOR
5) CONTAINER JOCKEY SYSTEM (JS-4001) 25 HP, TEFC MOTOR
6) DUST COLLECTION SYSTEM BLOWER (DC-4001) 10 HP, TEFC MOTOR
7) MIXER FLUSH WATER TANK MIXER (P-4001) 25 HP, TEFC MOTOR

PANEL MOUNTED EQUIPMENT

1) MIXING/BLENDING SYSTEM PUG MILL HAND SWITCH (ON-OFF) HS-401
2) WASTE SCALPING SCREEN HAND SWITCH (ON-OFF) HS-404
3) FINES TRANSFER CONVEYOR HAND SWITCH (ON-OFF) HS-405
4) TREATED WASTE TRANSPORT CONVEYOR HAND SWITCH (ON-OFF) HS-406
5) CONTAINER JOCKEY SYSTEM HAND SWITCH (HAND-OFF-AUTO) HS-408
6) DUST COLLECTION SYSTEM BLOWER HAND SWITCH (ON-OFF) HS-407
7) MIXER FLUSH WATER TANK MIXER HAND SWITCH (HAND-OFF-AUTO) HS-403
8) MIXING/BLENDING SYSTEM PUG MILL RUN INDICATION LIGHT (RED)
9) WASTE SCALPING SCREEN RUN INDICATION LIGHT (RED)
10) FINES TRANSFER CONVEYOR RUN INDICATION LIGHT (RED)
11) TREATED WASTE TRANSPORT CONVEYOR RUN INDICATION LIGHT (RED)
12) CONTAINER JOCKEY SYSTEM RUN INDICATION LIGHT (RED)
13) DUST COLLECTION SYSTEM BLOWER RUN INDICATION LIGHT (RED)
14) MIXER FLUSH WATER TANK MIXER RUN INDICATION LIGHT (RED)
15) FINES TRANSFER CONVEYOR SPEED INDICATING CONTROLLER SIC-405
16) TREATED WASTE TRANSPORT CONVEYOR SPEED IND CONTROLLER SIC-406
17) MIXER FLUSH WATER TANK LEVEL INDICATING CONTROLLER LIC-406
18) MIXER FLUSH WATER TANK LOW LEVEL SWITCH LSL-406
19) MIXER FLUSH WATER TANK HIGH LEVEL SWITCH LSH-406

20) EMERGENCY STOP PUSHBUTTON
21) PLC REMOTE RACK

ELECTRICAL EQUIPMENT
AREA 5000

MOTORS

I) NONE

PANEL MOUNTED EQUIPMENT

I) NONE

ELECTRICAL EQUIPMENT
AREA 6000

MOTORS

1) TREATED WASTE RECYCLE SYSTEM ROTARY FEED VALVE 5 HP VARIABLE SPEED, TEFC MOTOR
2) TREATED WASTE RECYCLE SYSTEM SCREW CONVEYOR 5 HP VARIABLE SPEED, TEFC MOTOR
3) TREATED WASTE RECYCLE SYSTEM VACUUM PUMP 40 HP VARIABLE SPEED, TEFC MOTOR

PANEL MOUNTED EQUIPMENT

1) TREATED WASTE RECYCLE SYSTEM ROTARY FEED VALVE HAND SW (ON-OFF) HS-601
2) TREAT WASTE RECYCLE SYSTEM SCREW CONVEYOR HAND SWITCH (ON-OFF) HS-602
3) TREATED WASTE RECYCLE SYSTEM VACUUM PUMP HAND SWITCH (ON-OFF) HS-603
4) TREAT WASTE RECYCLE SYSTEM ROTARY VALVE FEED RUN INDICATION LIGHT (RED)
5) TREAT WASTE RECYCLE SYSTEM SCREW CONVEYOR RUN INDICATION LIGHT (RED)
6) TREAT WASTE RECYCLE SYSTEM VACUUM PUMP RUN INDICATION LIGHT (RED)
7) TREATED WASTE RECYCLE ROTARY VALVE FEEDER SPEED IND CONT SIC-601
8) TREATED WASTE RECYCLE SYSTEM SCREW CONVEYOR SPEED IND CONT SIC-602

PART III

APPENDIX C

DESIGN BASIS DATA

Rev. 3
05/17/95

DESIGN BASIS DATA: PONDSLUDGE CDR – PONDS A/B

(Based on 1995 treatability testing – Dry Range Mid–Points Ponds A/B, Clarifier)

1.0 Pond Sludge Waste Physical Properties

1.1 PONDS 207A, 207B AND 788 CLARIFIER:

				Calculated values
Number of A/B Pond storage tanks:	Rev. 2	22		
Number of 788 Clarifier storage tanks:		2		
Total storage tanks:	Rev. 2	24		
Range of waste volume in tanks:		9,000–10,000	Gallons	
Design waste volume in tanks:		10,000	Gallons	
Estimated total volume of waste:		240,000	Gallons	
		1,188	Yd3	
Estimated % volume of settled sludge in tank:		90.0	% Volume	(Assumption)
Specific Gravity of liquid phase:		1.013		
Specific Gravity of sludge solids:		2.290		
CALCULATED VALUES FOR DESIGN				
Weight % solids in sludge:	Rev. 2	15.0	% Weight	(Assumption)
Calculated Specific Gravity of sludge:		1.105		
Calculated wt.% sludge in tank:		90.8	% Weight	
Net wt.% solids in tank:		13.6	% Weight	
Net Specific Gravity of combined slurry in tank:		1.096		
Total weight of slurry per tank:		45.7	Tons	
Total weight of slurry all tanks:		1,098	Tons	
Estimated dry solids in all tanks:		149	Tons	

2.0 Reagent Physical Properties

2.1 HYDRATED LIME:

Hydrated lime solids Specific Gravity:		2.200		
Hydrated lime bulk density:		65.0	Lbs/Ft3	
Hydrated lime addition rate (A/B Pond Sludge):	Rev. 3	150	Lbs/Ton slurry	(Assumption)
Hydrated lime addition rate (C Pond Slurry):	Rev. 3	150	Lbs/Ton slurry	(Assumption)

2.2 UNHYDRATED LIME (QUICKLIME):

Unhydrated lime solids Specific Gravity:	2.200	
Unhydrated lime bulk density:	65.0	Lbs/Ft3
Unhydrated lime addition rate (for drying):	0.320	lbs water/lb reagent
Unhydrated lime addition rate for pH (Ponds A/B):	0.0	Lbs/Ton dry solids

2.3 PORTLAND CEMENT (TYPE I/II):

Portland Cement reagent Specific Gravity:	3.170	
Portland cement reagent bulk density (lbs/ft3):	94.0	Lbs/Ft3
Specific Volume:	0.788	Yds/Ton

2.4 SILICA FLOUR

Dry Specific Gravity:	2.630	
Bulk density:	69.9	Lbs/Ft3
Specific Volume:	1.059	Yds/Ton
Ratio to cement:	0.0	Lbs/Lb cement

2.5 TYPE C FLYASH

Dry Specific Gravity:	2.740	
Bulk density:	50.0	Lbs/Ft3
Specific Volume:	1.481	Yds/Ton
Ratio to cement: Rev. 2	2.0	Lbs/Lb cement

2.6 PRODUCT CHARACTERISTICS:

Total pozzolan reagent addition rate: (Not including hydrated lime)	High:	0.300 Lbs water/lb total pozzolan
	Target:	0.225 Lbs water/lb total pozzolan
	Low:	0.200 Lbs water/lb total pozzolan
Estimated % Void Volume of Product:		30.0 % Volume
Target maximum product free moisture (after hydration):		15.0 % Weight

3.0 Summary of Physical Characteristics

Rev. 3
05/17/95

3.1 PONDS 207A, 207B AND 788 CLARIFIER:

	Free Liquid	Settled Sludge	Total Slurry
Percent Volume (Overall):	10	90	100
Total Volume (Gallons):	1,000	9,000	10,000
Specific Gravity (Net):	1.013	1.105	1.096
Specific Gravity (Solids):	NA	2.290	
%TSS:	0	15.0	13.6

SLUDGE CALCULATIONS

Sludge Mass/Tank:	41.51 Tons
Solids in Sludge/Tank:	6.23 Tons
Volume of Solids in Sludge:	87.2 Ft.3 652.2 Gallons
Total Mass Slurry (Liquid+Solids)/Tank:	45.74 Tons
Volume of Liquid/Tank	1,249.7 Ft.3 9,347.8 Gallons
Mass of Water/Tank:	39.51 Tons
Total Solids (All Tanks):	149 Tons
Total Liquid (All Tanks):	948 Tons
Total Slurry (All Tanks):	1,098 Tons

3.2 SUMMARY (tons):

	Total Water	Diss. Solids	Susp. Salts	Susp. Solids	Total Weight
PER TANK Ponds 207A, 207B and 788 Area Clarifier:	39.51			6.23	45.74
ALL TANKS Ponds 207A, 207B and 788 Area Clarifier (24):	948.31			149.45	1,097.76

4.0 Reagent Addition

4.1 SUMMARY OF REAGENT ADDITIONS

4.1.1 Basis: 1.00 tons slurry

ITEM	POND A/B		
	LOW	TARGET	HIGH
Water/Pozzolan ratio:	0.20	0.23	0.30
Gross weight liquid (Tons):	0.864	0.864	0.864
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	4.319	3.839	2.880
Amount of cement added (Tons):	1.440	1.280	0.960
Amount of flyash added (Tons):	2.880	2.560	1.920
Amount of unhydrated lime added (Tons):	0.075	0.075	0.075
Total weight of treated product (Tons):	5.394	4.914	3.955
Estimated S. G. of waste:	2.200	2.151	2.028
Estimate bulk density of waste (Lbs/Ft3)	96.071	93.931	88.552
Estimated volume of treated waste (Yd3):	4.159	3.875	3.308

4.3.2 Basis: Total Inventory of Sludge 1,097.8 *tons slurry*

ITEM	POND A/B		
	LOW	TARGET	HIGH
Number of Tanks:	24	24	44
Water/Pozzolan ratio:	0.20	0.23	0.30
Gross weight liquid (Tons):	948.3	948.3	948.3
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	4,741.5	4,214.7	3,161.0
Amount of cement added (Tons):	1,580.5	1,404.9	1,053.7
Amount of flyash added (Tons):	3,161.0	2,809.8	2,107.4
Amount of unhydrated lime added (Tons):	82.3	82.3	82.3
Total weight of treated product (Tons):	5,921.6	5,394.8	4,341.1
Estimated S. G. of waste:	2.200	2.151	2.028
Estimate bulk density of waste (Lbs/Ft3)	96.1	93.9	88.6
Estimated volume of treated waste (Yd3):	4,565.8	4,254.3	3,631.4

4.3.3 Basis: One days production @ 5000 gallons/day — 22.9 tons slurry/day

ITEM	POND A/B		
	LOW	TARGET	HIGH
Number of Tanks:	24	24	24
Water/Pozzolan ratio:	0.20	0.23	0.30
Gross weight liquid (Tons):	19.76	19.76	19.76
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	98.78	87.81	65.85
Amount of cement added (Tons):	32.93	29.27	21.95
Amount of flyash added (Tons):	65.85	58.54	43.90
Amount of unhydrated lime added (Tons):	1.72	1.72	1.72
Total weight of treated product (Tons):	123.37	112.39	90.44
Estimated S. G. of waste:	2.200	2.151	2.028
Estimate bulk density of waste (Lbs/Ft3)	96.1	93.9	88.6
Estimated volume of treated waste (Yd3):	95.1	88.6	75.7

4.3.4 Basis: One hours production @ 1000 gallons/hour — 4.6 tons slurry/hour
(5.0 hours/day net operating time – two shifts) — 16.67 gpm slurry

ITEM	POND A/B		
	LOW	TARGET	HIGH
Number of Tanks:	24	24	24
Water/Pozzolan ratio:	0.20	0.23	0.30
Gross weight liquid (Tons):	3.95	3.95	3.95
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	19.76	17.56	13.17
Amount of cement added (Tons):	6.59	5.85	4.39
Amount of flyash added (Tons):	13.17	11.71	8.78
Amount of unhydrated lime added (Tons):	0.34	0.34	0.34
Total weight of treated product (Tons):	24.67	22.48	18.09
Estimated S. G. of waste:	2.200	2.151	2.028
Estimate bulk density of waste (Lbs/Ft3)	96.1	93.9	88.6
Estimated volume of treated waste (Yd3):	19.0	17.7	15.1

4.3.5 Basis: One hours production @ 1000 gallons/hour	5.57	5.57	5.57	tons slurry/hour
(Includes an average of 1.0 tpn or about 5% of excess	16.67			gpm slurry
pozzolans recycled in feed sludge slurry to mixing/blending.)	29.10	29.10	29.10	wt% solids in feed including excess pozzolans

ITEM	POND A/B		
	LOW	TARGET	HIGH
Number of Tanks:	24	24	24
Water/Pozzolan ratio:	0.20	0.23	0.30
Gross weight liquid (Tons):	3.95	3.95	3.95
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	19.76	17.56	13.17
Amount of cement added (Tons):	6.59	5.85	4.39
Amount of flyash added (Tons):	13.17	11.71	8.78
Amount of unhydrated lime added (Tons):	0.34	0.34	0.34
Total weight of treated product (Tons):	25.67	23.48	19.09
Estimated S. G. of waste:	2.220	2.174	2.059
Estimate bulk density of waste (Lbs/Ft3)	96.1	93.9	88.6
Estimated volume of treated waste (Yd3):	19.8	18.5	16.0

DESIGN BASIS DATA: PONDSLUDGE CDR – POND C

(Based on 1995 treatability testing – Target Assumptions Pond C)

Rev. 4
05/17/95

1.0 POND SLUDGE WASTE PHYSICAL PROPERTIES

1.1 POND 207C:

Number of C Pond storage tanks:	Rev. 4	54		
Range of waste volume in tanks:		9,000–10,000	Gallons	
Design waste volume in tanks:		10,000	Gallons	
Estimated total volume of waste:		540,000 2,674	Gallons Yd3	
Design % TDS of saturated brine phase:		56.1	% TDS	Iteration value
Calculated Specific Gravity of liquid phase: (S.G. = 1.000 + (%TDS * 0.0088459)		1.496		
Specific Gravity of salt solids:	Rev. 2	2.219	Back–calculated	
Specific Gravity of silt solids:		2.230		
Weight % solids in settled salt:		60.0	% Weight	
Weight % solids in settled silt:		60.0	% Weight	

ASSUMED VALUES FOR DESIGN

Estimated % volume of settled salt slurry in tank:	Rev. 2	5.0	% Volume	(Assumption)
Estimated % volume of settled silt slurry in tank:	Rev. 2	5.0	% Volume	(Assumption)
Volume of settled salt:		500.0	Gallons	
Volume of settled silt:		500.0	Gallons	

SETTLED SALT SLURRY LAYER

Specific gravity:	Rev. 2	1.860	Back–calculated	
Weight of salt solids:		2.328	Tons	
Weight liquid brine phase:		1.552	Tons	
Weight dissolved salt:		0.871	Tons	
Weight of free water:		0.681	Tons	

Rev. 4
05/17/95

SETTLED SILT SLURRY LAYER

Specific gravity:		1.864	
Weight of silt solids:		2.334	Tons
Weight liquid brine phase:		1.556	Tons
Weight dissolved salt:		0.873	Tons
Weight of free water:		0.683	Tons

FREE LIQUID BRINE LAYER

Calculated Specific Gravity of liquid phase:	Rev. 1	1.496	Back–calculated
Weight liquid brine phase:		56.188	Tons
Weight dissolved salt:		31.521	Tons
Weight of free water:		24.666	Tons

TOTAL POND C

Specific Gravity of Brine Slurry (Average Measured):		1.530	
Calculated Specific Gravity of Brine Slurry:		1.533	by iteration
Total weight salt (solids+ dissolved):		34.722	Tons
Total weight of salt solids:		2.328	
Total weight of silt solids:		2.334	Tons
Total weight of brine liquid:		59.296	
Weight of free water:		26.031	Tons
Weight of slurry per tank:		63.957	Tons
Equivalent weight percent suspended solids (%TSS):	Rev. 2	7.288	Weight %
Total weight of slurry all tanks:		3,454	Tons
Estimated dry solids in all tanks:		252	Tons

2.0 Reagent Physical Properties

Rev. 4
05/17/95

2.1 HYDRATED LIME:

Hydrated lime solids Specific Gravity:		2.200		
Hydrated lime bulk density:		65.0	Lbs/Ft3	
Hydrated lime addition rate (A/B Pond Sludge):	Rev.3	150	Lbs/Ton slurry	(Assumption)
Hydrated lime addition rate (C Pond Slurry):	Rev.3	150	Lbs/Ton slurry	(Assumption)

2.2 UNHYDRATED LIME (QUICKLIME):

Unhydrated lime solids Specific Gravity:	2.200		
Unhydrated lime bulk density:	65.0	Lbs/Ft3	
Unhydrated lime addition rate (for drying):	0.320	lbs water/lb reagent	
Unhydrated lime addition rate for pH (Pond C):	0.0	Lbs/Ton slurry	(Assumption)

2.3 PORTLAND CEMENT (TYPE I/II):

Portland Cement reagent Specific Gravity:	3.170		
Portland cement reagent bulk density (lbs/ft3):	94.0	Lbs/Ft3	
Specific Volume:	0.788	Yds/Ton	

2.4 SILICA FLOUR

Dry Specific Gravity:	2.630		
Bulk density:	69.9	Lbs/Ft3	
Specific Volume:	1.059	Yds/Ton	
Ratio to cement:	0.0	Lbs/Lb cement	(Assumption)

2.5 TYPE C FLYASH

Dry Specific Gravity:		2.740		
Bulk density:		50.0	Lbs/Ft3	
Specific Volume:		1.481	Yds/Ton	
Ratio to cement:	Rev. 2	2.0	Lbs/Lb cement	(Assumption)

2.6 PRODUCT CHARACTERISTICS:

Total pozzolan reagent addition rate: (Not including hydrated lime)	High:	0.300	Lbs water/lb total pozzolan
	Target:	0.175	Lbs water/lb total pozzolan
	Low:	0.100	Lbs water/lb total pozzolan
Estimated % Void Volume of Product:		30.0	% Volume
Target maximum product free moisture (after hydration):		15.0	% Weight

3.0 Summary of Physical Characteristics

Rev. 4
05/17/95

3.1 POND 207C:

	Brine Liquid	Salt Layer	Silt Layer	Total Slurry
Percent Volume (Overall):	90	5	5	100
Total Volume (Gallons):	9,000	500	500	10,000
%TDS (Liquid)	56.1	56.1	56.1	56.1
Specific Gravity (Net):	1.496	1.860	1.864	1.533
Specific Gravity (Solids):	NA	2.219	2.230	
%TSS:		60.0	60.0	

BRINE CALCULATIONS/TANK

Free Brine Layer Mass:	56.19 Tons
Dissolved Salt Mass:	31.52 Tons
Water Mass:	24.67 Tons

SALT LAYER CALCULATIONS/TANK

%TSS:	60.0 Wt.%
Salt Layer Mass:	3.88 Tons
Suspended Salts Mass:	2.33 Tons
Entrained Brine Mass:	1.55 Tons
Dissolved Salt Mass:	0.87 Tons
Water Mass:	0.68 Tons

SILT LAYER CALCULATIONS/TANK

%TSS:	60.0 Wt.%
Silt Layer Mass:	3.89 Tons
Suspended Silt Solids Mass:	2.33 Tons
Entrained Brine Mass:	1.56 Tons
Dissolved Salt Mass:	0.87 Tons
Water Mass:	0.68 Tons

3.2 SUMMARY (Tons)

Rev. 4
05/17/95

	Total Water	Diss. Solids	Susp. Salts	Susp. Solids	Total Weight
PER TANK					
Pond 207C:	26.03	33.26	2.33	2.33	63.96
ALL TANKS					
Pond 207C (42):	1,405.66	1,796.30	125.70	126.02	3,453.68

4.0 Reagent Addition

4.1 SUMMARY OF CEMENT AND SOIL REQUIRMENTS

4.1.1 Basis: 1.00 tons Pond C slurry

ITEM	POND C		
	LOW	TARGET	HIGH
Water/Pozzolan ratio:	0.10	0.18	0.30
Gross weight free water (Tons):	0.407	0.407	0.407
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	4.070	2.326	1.357
Amount of cement added (Tons):	1.357	0.775	0.452
Amount of flyash added (Tons):	2.713	1.550	0.904
Amount of unhydrated lime added (Tons):	0.075	0.075	0.075
Total weight of treated product (Tons):	5.145	3.401	2.432
Estimated S. G. of waste:	2.445	2.272	2.098
Estimate bulk density of waste (Lbs/Ft3)	106.7	99.2	91.6
Estimated volume of treated waste (Yd3):	3.571	2.540	1.967

4.1.2 Basis: Total Inventory of Sludge 3,453.7 tons slurry

ITEM	POND C		
	LOW	TARGET	HIGH
Number of Tanks:	54	54	54
Water/Pozzolan ratio:	0.10	0.18	0.30
Gross weight liquid (Tons):	1,405.7	1,405.7	1,405.7
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	14,056.6	8,032.3	4,685.5
Amount of cement added (Tons):	4,685.5	2,677.4	1,561.8
Amount of flyash added (Tons):	9,371.1	5,354.9	3,123.7
Amount of unhydrated lime added (Tons):	259.0	259.0	259.0
Total weight of treated product (Tons):	17,769.3	11,745.1	8,398.2
Estimated S. G. of waste:	2.445	2.272	2.098
Estimate bulk density of waste (Lbs/Ft3)	106.7	99.2	91.6
Estimated volume of treated waste (Yd3):	12,333.1	8,771.4	6,792.7

4.1.3 Basis: One days production @ 5000 gallons/day — 32.0 tons slurry/day

ITEM	POND C		
	LOW	TARGET	HIGH
Number of Tanks:	54	54	54
Water/Pozzolan ratio:	0.10	0.18	0.30
Gross weight liquid (Tons):	13.02	13.02	13.02
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	130.15	74.37	43.38
Amount of cement added (Tons):	43.38	24.79	14.46
Amount of flyash added (Tons):	86.77	49.58	28.92
Amount of unhydrated lime added (Tons):	2.40	2.40	2.40
Total weight of treated product (Tons):	164.53	108.75	77.76
Estimated S. G. of waste:	2.445	2.272	2.098
Estimate bulk density of waste (Lbs/Ft3)	106.7	99.2	91.6
Estimated volume of treated waste (Yd3):	114.2	81.2	62.9

4.1.4 Basis: One hours production @ 1000 gallons/hour — 6.4 tons slurry/hour
(5.0 hours/day net operating time – two shifts) — 16.67 gpm slurry

ITEM	POND C		
	LOW	TARGET	HIGH
Number of Tanks:	54	54	54
Water/Pozzolan ratio:	0.10	0.18	0.30
Gross weight liquid (Tons):	2.60	2.60	2.60
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	26.03	14.87	8.68
Amount of cement added (Tons):	8.68	4.96	2.89
Amount of flyash added (Tons):	17.35	9.92	5.78
Amount of unhydrated lime added (Tons):	0.48	0.48	0.48
Total weight of treated product (Tons):	32.91	21.75	15.55
Estimated S. G. of waste:	2.445	2.272	2.098
Estimate bulk density of waste (Lbs/Ft3)	106.7	99.2	91.6
Estimated volume of treated waste (Yd3):	22.8	16.2	12.6

4.1.5 Basis: One hours production @ 1000 gallons/hour (Includes an average of 1.0 tph or about 5% of excess pozzolans recycled in feed sludge slurry to mixing/blending.)	7.40	7.40	7.40	tons slurry/hour
	16.67			gpm slurry
	25.28	25.28	25.28	wt% solids in feed including excess pozzolans

ITEM	POND C		
	LOW	TARGET	HIGH
Number of Tanks:	54	54	54
Water/Pozzolan ratio:	0.10	0.18	0.30
Gross weight liquid (Tons):	2.60	2.60	2.60
Flyash/Cement ratio:	2.00	2.00	2.00
Total pozzolan added (Tons):	26.03	14.87	8.68
Amount of cement added (Tons):	8.68	4.96	2.89
Amount of flyash added (Tons):	17.35	9.92	5.78
Amount of unhydrated lime added (Tons):	0.48	0.48	0.48
Total weight of treated product (Tons):	33.91	22.75	16.55
Estimated S. G. of waste:	2.455	2.292	2.131
Estimate bulk density of waste (Lbs/Ft3)	106.7	99.2	91.6
Estimated volume of treated waste (Yd3):	23.5	17.0	13.4

PART III

APPENDIX D

DETAILED COST ESTIMATE

RFETS
Accelerated Pond Sludge Processing
Pond Sludge Treatment System
Sheet 1 of 5
(RFASPS1)
5/23/95

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer	4	MO	1000.00				4000				4000	
2) Equipment Mobilization/Demobilization		LS	15000.00				15000				15000	
3) Site Utilities	4	MO	3000.00				12000				12000	
4) Decontamination Trailer	4	MO	1500.00				6000				6000	
AREA 1000												
SLUDGE TRANSFER UNIT												
1) Sludge Vacuum Transfer System incl. Vacuum Pump, Cone W/Bottom Hopper, Manual Pinch Valve, HEPA Filter (VTS -1001)	1			90000.00	9000.00	9000.00		90000	9000	9000	108000	
2) Sludge Transfer Pump (P-1001)	1			5000.00	800.00			5000	800		5800	Relocate Exist. Pump
3) Sludge Transfer Flow System incl. Flow Element & Control Unit, Indicator/ Transmitter (FIS-1001)	1				1500.00				1500		1500	Relocate Exist. Panel
4) Solids Concentration Monitoring System incl. Flow Element, Indicator/Transmitter (MIS-1001)	1			8500.00	1500.00			8500	1500		10000	
5) Sludge Removal Level Control System incl. Level Element/Transmitter, Indicator/ Controller (LCS-1001)	1			6000.00	1500.00			6000	1500		7500	
6) Sludge Transfer Unit Control Panel incl. % Solid Flow Indicator, On-Off PB, Variable Speed Control, Running Lights (CP-1001)	1			10400.00	1000.00			10400	1000		11400	
7) Flush System Submerged Pump (P-1002)	1			2620.00	400.00			2620	400		3020	
8) Cross-Country Transfer Piping - 2" 100' Lg. Reinf. Rubber W/Quick Disc. Conn.(PIP-1001)	20			500.00	50.00			10000	1000		11000	
9) Vacuum-Suction Transfer Piping - 4" - 5' Lg. Flexible Hose W/Quick Disc. Conn. (PIP-1002)	8			275.00	25.00			2200	200		2400	
10) Containment Piping - 4" 100' Lg. Fire Hose Locking Collar Conn. (PIP-1003)	10			400.00	50.00			4000	500		4500	
11) Suction Wand - 4" W/Suction Control Valve (SP-1001)	2			500.00	50.00			1000	100		1100	
12) Flush System Wand - 2" W/Manual Control Valve (SP-1002)	2			300.00	50.00			600	100		700	
13) Oversized Waste Container (CON-1001)	1				200.00	200.00			200	200	400	Relocate Existing Con
14) Man-Lift, Hydraulic Scissor Type, 2-Man, 14' Lift, 1000# Capacity (FIS-1001)	1			15000.00	400.00			15000	400		15400	
15) Electrical												
a) Starters												
a1) #1	2			1075.00	175.00			2150	350		2500	
a2) #4	1			4975.00	570.00			4975	570		5545	
b) Conduit, Cable, Control												
b1) #1	2			160.00	350.00			320	700		1020	
b2) #4	1			750.00	750.00			750	750		1500	
c) Grounding	LS			1500.00	1500.00			1500	1500		3000	
d) Miscellaneous Wiring	LS			1500.00	1500.00			1500	1500		3000	
e) Coaxial Cable - 100'	1			50.00	100.00			50	100		150	
AREA 2000												
SLUDGE FEED UNIT												
1) Sludge Feed Tank, 10' dia. x 4' s.s. w/4'-8" Cone Bottom (D-2001)	1			5400.00	14000.00	14000.00		5400	14000	14000	33100	Adapt Exist. Tank
2) Sludge Feed Tank Mixer (A-2001)	1			2000.00	600.00			2000	600		2600	Relocate Exist.Mixer

RFETS
Accelerated Pond Sludge Processing
Pond Sludge Treatment System
Sheet 2 of 5
(RFASPS1)
5/23/95

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
3) Sludge Feed Pump, Progressive Positive Displacement, 0-50 GPM (P-2001)	1			1500.00	600.00			1500	600		2100	Relocate Exist. Pump
4) Sludge Feed Tank, 10' dia. x 4' s.s. w/1'-8" Cone Bottom (D-2002)	1			8100.00	800.00			8100	800		8900	
5) Sludge Feed Tank Mixer (A-2002)	1			11000.00	800.00			11000	800		11800	
6) Sludge Feed Pump, Progressive Positive Displacement, 0-50 GPM (P-2002)	1			8700.00	600.00			8700	600		9300	
7) Process Water Tank, 8' dia. x 8'Ht. 3000 Gallons (D-2003)	1			1500.00	1000.00			1500	1000		2500	Relocate Exist. Tank
8) Process Water Pump, Horizontal Centrifugal 200 GPM @ 112 PSIG (P-2003)	1			4500.00	600.00			4500	600		5100	Relocate Exist. Pump
9) Flush Water Pump, Horizontal Centrifugal 150 GPM @ 50 PSIG (P-2004)	1			2700.00	600.00			2700	600		3300	Relocate Exist. Pump
10) Sludge Flow Monitoring System incl. Flow Element, Indicator/ Transmitter (FCS-2001)	1				1500.00				1500		1500	Relocate Exist.Panel
11) TSS Solids Concentration Monitoring System incl. Flow Element, Indicator/ Transmitter (MCS-2001)	1				1500.00				1500		1500	Relocate Exist.Panel
12) TDS Solids Concentration Monitoring System incl. Flow Element, Indicator/ Transmitter (CCS-2001)	3			6000.00	1500.00			18000	4500		22500	
13) Level Control System incl. Level Element/ Transmitter, Indicator/Controller (LCS-2001) (LCS-2002) (LCS-2003)	1			2500.00	600.00			2500	600		3100	
14) Temperature Control System incl. Thermocouple Indicator/Controller (TCS-2001)	2			1000.00	400.00			2000	800		2800	
15) Self Priming Decant Pump, Centrifugal Slurry, 30 GPM (P-2005, P-2006)	1			20500.00	2000.00			20500	2000		22500	
16) Sludge Feed Unit Control Panel incl. Flow Indicators-% TDS & % Solids, On-Off PB, Variable Speed Controls, Running Lights (CP-2001)												
17) Electrical												
a) Starters												
a1) #1	6			1075.00	175.00			6450	1050		7500	
a2) #2	1			1600.00	228.00			1600	228		1828	
a3) #3	1			2650.00	345.00			2650	345		2995	
b) Conduit, Cable, Control												
b1) #1	6			160.00	350.00			960	2100		3060	
b2) #2	1			230.00	370.00			230	370		600	
b3) #3	1			260.00	400.00			260	400		660	
c) Grounding	LS			4000.00	4000.00			4000	4000		8000	
d) Miscellaneous Wiring	LS			8000.00	8000.00			8000	8000		16000	
e) Coaxial Cable - 100'	1			50.00	100.00			50	100		150	
AREA 3000												
TREATMENT ADDITIVE STORAGE AND FEED UNIT												
1) Pozzolanic Reagent Silo incl. Cone Bottom, Live Vibrating Cone Bottom, Knife Gate, Hi & Lo Level Alarm, Top Mounted Baghouse Filter, Top Fill Connection (D-3001) (D-3002)	2			120000.00	12000.00	12000.00		240000	24000	24000	288000	12' dia. x 31' sub

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
2) Pozzolanic Reagent Feed System incl. Rotary Valve Feeder, V.S. Weigh Belt, V.S. Screw Conveyor (AFS-3001) (AFS-3002)	2			38200.00	7700.00	3900.00		76400	15400	7800	99600	0 - 30 tph
3) Hydrated Lime Silo incl. Cone Bottom, Live Vibrating Cone Bottom, Knife Gate, Hi & Lo Level Alarm, Top Mounted Baghouse Filter, Top Fill Connection (D-3003)	1				10000.00	10000.00	0	10000	10000		29000	Relocate Exist.Silo 10' dia. x 14.7' ssh
4) Hydrated Lime Feed System incl. Rotary Valve Feeder, V.S. Weigh Belt, V.S. Screw Conveyor (AFS-3003)	1			35500.00	7400.00	3700.00		36500	7400	3700	47600	0 5 tph
5) Storage Silo Level Indicating System incl. Level Element/Transmitter, Indicator (LCS-3001) (LCS-3002) (LCS-3003)	3			3000.00	1500.00			9000	4500		13500	
6) Additive Feed Unit Control Panel (AFS-3001) (AFS-3002) (AFS-3003) incl. On-Off PB, Variable Speed Drive Control, Level Alarms, Running Lights (CP-3001) (CP-3002) (CP-3003)	3			6200.00	800.00			18600	2400		21000	
7) Electrical												
a) Starters												
a1) #1												
b) Conduit, Cable, Control	3			1075.00	175.00			3225	525		3750	
b1) #1												
c) Grounding	3			160.00	350.00			480	1050		1530	
d) Miscellaneous Wiring	LS			1500.00	1500.00			1500	1500		3000	
e) Coaxial Cable - 100'	LS			1500.00	1500.00			1500	1500		3000	
	3			50.00	100.00			150	300		150	
AREA 4000 MIXING/BLENDING TREATMENT UNIT												
1) Mixing/Blending Unit incl. Pug Mill Mixing Unit, Cone Bottom Feed Hopper, Adjustable Manual Discharge Weir (MBS-4001)	1			26000.00	2000.00	2000.00		26000	2000	2000	30000	0 30 tph
2) Waste Vibrating Scalping Screen (SCN-4001)	1			32500.00	3500.00	3500.00		32500	3500	3500	39500	
3) Fines Transfer Conveyor (CV-4001)	1			15000.00	3000.00	3000.00		15000	3000	3000	21000	
4) Treated Waste Product Transport Conveyor (CV-4002)	1			25000.00	5000.00	5000.00		25000	5000	5000	35000	
5) Recycle Conveyor (CV-4003)	1			30000.00	6000.00	6000.00		30000	6000	6000	42000	
6) Treated Waste Container Jockey Two-Way Winch System (JS-4001)	1			36000.00	7200.00	3600.00		36000	7200	3600	46800	
7) Exhaust Air Dust Collection System incl. Baghouse, Hopper, Vacuum Blower (DCS-4001)	1			28300.00	5600.00	2800.00		28300	5600	2800	36700	
8) Dust Container (CON-4001)	1			1800.00	200.00	200.00		1800	200	200	2200	
9) Mixing/Blending Treatment Unit Control Panel incl. (6) Feed Rate (Wgt) Indicators, Logic Controller For Mix Control, On-Off PB, Variable Speed Controls, Running Lights (CP-4001)	1			21600.00	2000.00			21600	2000		23600	
10) Mixer Flush Water Tank - 5' dia. x 5' 575 Gallon (D-4001)	1				800.00	800.00			800	800	1600	Relocate Exist. Tank
11) Mixer Water Flush Pump, Vertical Centrifugal 200 GPM @ 50 PSIG (P-4001)	1			3200.00	800.00			3200	800		3000	Relocate Exist. Pump

RFETS
Accelerated Pond Sludge Processing
Pond Sludge Treatment System
Sheet 4 of 5
(RFASPS1)
5/23/95

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
12) Electrical												
a) Starters												
a1) #1	4			1075.00	175.00		4300	700			5000	
a2) #2	4			1600.00	228.00		6400	912			7312	
b) Conduit, Cable, Control												
b1) #1	4			160.00	350.00		640	1100			2040	
b2) #2	4			230.00	370.00		920	1480			2400	
c) Grounding	LS			2000.00	2000.00		2000	2000			4000	
d) Miscellaneous Wiring	LS			4000.00	4000.00		4000	4000			8000	
e) Coaxial Cable - 100'	1			50.00	100.00		50	100			150	
AREA 5000												
TREATED WASTE STORAGE AND TRANSPORT UNITS												
1) Treated Waste Transport/Storage Container Roll-Off Type, 30 cy (Con-5001 To CON-5012)	12			6000.00	600.00	600.00	72000	7200	7200		86400	
AREA 6000												
TREATED WASTE RECYCLE UNIT												
1) Treated Waste Vacuum Recycle Unit incl. 2400 cfm Vacuum Pump, 75 cf Cone Bottom Hopper, Rotary Valve Feeder, V.S. Screw Feeder, Hand Controlled Suction Wand & Hose, HEPA Filter (VTS-6001)	1			55000.00	11000.00	5500.00	55000	11000	5500		71500	
2) Suction Piping - 4" - 10' Lg. Flexible Hose W/Quick Disc. Conn. (PIP-6001)	4			550.00	50.00		2200	200			2400	
3) Suction Wand - 4' w/Suction Control Valve (SW-6001)	1			500.00	50.00		500	50			550	
4) Level Indicating System Incl. Level Element/ Transmitter, Indicator (LIS-6001)	3			3000.00	1500.00		9000	4500			13500	
5) Treated Waste Recycle System Control Panel incl. Speed (rpm,% range, etc.) Indicators, On-Off PB, Variable Speed Controls, Running Lights (CP-6001)	1			10400.00	1000.00		10400	1000			11400	
6) Electrical												
a) Starters												
a1) #1	3			1075.00	175.00		3225	525			3750	
b) Conduit, Cable, Control												
b1) #1	3			160.00	350.00		480	1050			1530	
c) Grounding	LS			1500.00	1500.00		1500	1500			3000	
d) Miscellaneous Wiring	LS			3000.00	3000.00		3000	3000			6000	
e) Coaxial Cable - 100'	1			50.00	100.00		50	100			150	
							37000	1061585	217655	108300	1421540	

RFETS
Accelerated Pond Sludge Processing
Pond Sludge Treatment System
Sheet 5 of 5
(RFASPS1)
5/23/95

Item	Qty	Unit	Unit Cost: Sub.	Mat.	Labor	Equip.	Total Cost: Sub.	Mat.	Labor	Equip.	Total Direct Cost	Comments
SHEET 4 TOTAL							37000	1061585	217655	108309	1424540	
Material Shipping (5% Of Material)								53079			53079	
Level "D" Protection (43% Of Labor)									93592		93592	
							37000	1114664	311247	108309	1571211	
Burden @ 30% of Labor Cost									93374		93374	
Labor @ 10% of Labor Cost									31125		31125	
Material @ 10% of Material Cost								111466			111466	
SubContract @ 10% of Sub. Cost							3700				3700	
Total Direct Cost							40700	1226131	435745	108309	1810876	
Indirects @ 75% of Total Direct Labor Cost									326809		326809	
Profit @ 10% of Total Direct Cost											181088	
Health & Safety Monitoring @ 10%											2318773	
Total Field Cost											231877	
Contingency @ 20% of Total Field Cost											2550650	
TOTAL COST THIS PAGE											510130	
											3060780	

RFETS
Accelerated Pond Sludge Processing
Pond Sludge Treatment System
Operating & Maintenance Cost
(OMRFPS1)
5/25/95

Project Costs - (16 hr/day - 10 months)

ITEM	QTY	UNIT	UNITS	ITEM $	NOTES
1. Energy					
a. Electric	1063309	Kw-hr	.085	$90381	
2. Maintenance				$52400	3% of Capital Cost
3. Area 1000					
a. Equipment Operator	1290	DAY	280.00	$361200	
4. Area 2000					
a. Equipment Operator	860	DAY	280.00	$240800	
5. Area 3000					
a. Equipment Operator	430	DAY	280.00	$120400	
6. Area 4000					
a. Equipment Operator	2150	DAY	280.00	$602000	
7. Area 5000					
a. Equipment Operator	430	DAY	280.00	$120400	
b. Truck Driver	860	DAY	280.00	$240800	
c. Sampler	430	DAY	280.00	$120400	
d. Lab Personnel	645	DAY	280.00	$180600	
8. Area 6000					
a. Equipment Operator	430	DAY	280.00	$120400	
9. Maintenance					
a. Day	860	DAY	280.00	$240800	
b. Night	430	DAY	280.00	$120400	
10. Supervision					
a. Day	645	DAY	440.00	$283800	
b. Night	430	DAY	440.00	$189200	
11. Chemical					
a. Hydrated Lime	342	TON	80.00	$27360	
b. Pozzolanic Mixture	12309	TON	200.00	$2461800	
TOTAL PROJECT OPERATING COSTS				$5573141	

RFETS
Accelerated Pond Sludge Processing
Pond Sludge Treatment System
Treatment System Decontamination/Decommissioning
(RFPSDC)
5/23/95

Item	Qty	Unit	Unit Cost Sub.	Unit Cost Mat.	Unit Cost Labor	Unit Cost Equip.	Total Cost Sub.	Total Cost Mat.	Total Cost Labor	Total Cost Equip.	Total Direct Cost	Comments
AREA 1000												
SLUDGE TRANSFER UNIT												
1) Equipment Decon	400	MH			25.00	15.00			10000	6000	16000	
2) Dismantling	300	MH			25.00	20.00			7500	6000	13500	
AREA 2000												
SLUDGE FEED UNIT												
1) Equipment Decon	208	MH			25.00	15.00			5200	3120	8320	
2) Dismantling	156	MH			25.00	20.00			3900	3120	7020	
AREA 3000												
TREATMENT ADDITIVE STORAGE & FEED UNIT												
1) Empty Storage Silo	100	MH			25.00	10.00			2500	1000	3500	
2) Equipment Decon	264	MH			25.00	15.00			6600	3960	10560	
3) Dismantling	176	MH			25.00	20.00			4400	3520	7920	
AREA 4000												
MIXING/BLENDING TREATMENT UNIT												
1) Equipment Decon	240	MH			25.00	15.00			6000	3600	9600	
2) Dismantling	180	MH			25.00	20.00			4500	3600	8100	
AREA 5000												
TREATED WASTE STORAGE & TRANSPORT UNITS												
1) Equipment Decon	192	MH			25.00	15.00			4800	2680	7680	
AREA 6000												
TREATED WASTE RECYCLE UNIT												
1) Equipment Decon	112	MH			25.00	15.00			2800	1680	4480	
2) Dismantling	84	MH			25.00	20.00			2100	1680	3780	
Level "D" Protection (43% Of Labor)							0	0	60300	40160	100460	
									25929		25929	
							0	0	86229	40160	126389	
Burden @ 30% of Labor Cost									25869		25869	
Labor @ 10% of Labor Cost									8623		8623	
Material @ 10% of Material Cost								0			0	
SubContract @ 10% of Sub. Cost							0				0	
Total Direct Cost							0	0	120721	40160	160881	
Indirects @ 75% of Total Direct Labor Cost									90540		90540	
Profit @ 10% of Total Direct Cost											16088	
Health & Safety Monitoring @ 10%											267509	
Total Field Cost											26751	
Contingency @ 20% of Total Field Cost											294260	
TOTAL COST THIS PAGE											58852	
											353112	

PART III

APPENDIX E

GES SCREEN

GES SCREEN

Job#: Solar Pond Projects 12189 Bldg. 750 Pad

Title: Accelerated Pondsludge Processing

Description: The design & construction of a processing system to treat pondsludge removed from Solar Ponds for remediation.

SECTION A - NUCLEAR WORK PROCESS REQUIRED		Y	N
1.	Does work affect/modify Vital Safety Systems		
	a. Modify VSS hardware, software or require a change in VSS?	___	X
	b. Impact a vital safety function during installation, modification, or repair?	___	X
	c. Will this work create a "Violation" with respect to any Criticality Safety Operating Limit (CSOL) or Nuclear Material Safety Limit (NMSL), or is a new CSOL or NMSL required?	___	X
	d. Will this work require any modification, addition or deletion of an existing VSS procedure?	___	X
	e. Will this work impact any system for which credit is taken in an Operational Safety Requirement (OSR)?	___	X
	f. Will this work create an "Out-of-Tolerance" with respect to an OSR Limiting Condition of Operation (LCO)?	___	X
2.	Does work involve Hazardous Chemicals of sufficient quantity and/or type to pose potential for catastrophic events? (If applicable, refer to COEM, Section 6.3.6, Appendix 6).	___	X

SECTION B - SAFEGUARDS AND SECURITY SYSTEMS			
1.	Does work affect Safeguards and Security Systems:	___	X

SECTION C - ENGINEERING SUPPORT PROGRAM (ESP) ELIGIBILITY

If the answer to any of the above questions is "yes," then this modification does not qualify for GES. If all answers are "no," use GES program. Tasks "failing" the screen may still use GES program, if Appendix 7 and Section 6.4 for the EDMPP development is approved by E&SS management.

1. Work is assigned to: GES program

Douglas W. Few 3-31-95

Preparing Engineer Date

PART III

APPENDIX F

SYSTEM CLASSIFICATION FORM

SYSTEM CLASSIFICATION FORM

WORK CONTROL NO. 12189 TITLE: SOLAR POND PROJECTS

System Name: WASTE TREATMENT - POND SLUDGE PROCESSING

Bldg.: TENT # 12 Location: 750 PAD

6.1.1 SYSTEM REFERENCE DOCUMENTS:

6.1.2 SYSTEM FUNCTIONS AND OPERATING MODES

6.2 SYSTEM CLASSIFICATION (Identity references from those documents listed in Section 6.1.1 and enter technical justification on appropriate space below).

Category 1 ☐ 2 ☐ 3 ☒ 4 ☐

Basis: POND SLUDGE PROCESSING "SYSTEM" TO PROVIDE PERSONNEL & ENVIRONMENT PROTECTION PER C.O.E.M. 6.1[6]. POND SLUDGE PROCESSING "SYSTEM", "STRUCTURES", OR COMPONENTS DO NOT MEET THE REQUIREMENTS OF SYSTEM CLASSIFICATION (SC-1 or SC-2). HAZARDS INCLUDE PERSONNEL SAFETY & RADIOLOGICAL PROTECTION.

D.W. FEW — Cognizant Engineer Print Name

Douglas W. Few x8542 — Cognizant Engineer Signature, Ext./DP

11JAN95 — Date

D. 7766

DES-223/2-1(1) 07/28/93

PART III

APPENDIX G

OPERATIONAL REQUIREMENTS DOCUMENT

ACCELERATED PONDSLUDGE PROCESSING

Operational Requirements Document (ORD)

1.1 New Facility

- Not Required

1.2 Modifications to an Existing Facility

1.2.1 Describe the purpose of this facility.

- The goal of this Accelerated Pondsludge Processing project is to erect a temporary treatment facility that will minimally treat Pondsludge currently stored on the 750 Pad in 78 10,000 gallon storage tanks. This facility will support the Environmental Restoration of OU4 Solar Ponds Remediation Programs. Tent #12, 750 Pad is the Temporary Facility addressed in this ORD document.

1.2.2 What is the proposed location?

- Tent #12, is the proposed location for Solar Ponds "Accelerated Pondsludge Processing" facility. This location was selected for the following criteria: (1) Tent #12 allows the required pad space adjoining the process tent for bulk additive materials storage ex. (lime & cement). Silos will be used to store additive materials for process treatment facility. (2) Tent (12) location will be accessible for bulk feed material delivery without major modifications to existing Pad & Roadways.

2.1 Utility Requirement

2.1.1 What utilities and services are required?

- The utilities and services required include: process water to be used for process requirements and to wash down equipments, Ventilation for process and personnel protection to be determined. A propane heating system consistent with other heated tents on the 750 pad will be required, winter design temperature (55 degrees Fahrenheit). Tent #12 is a single wall constructed tent that offers minimal insulation benefits.

2.2.1 Describe special power requirements.

- Tent #12 will require electrical service for lighting, receptacles and process equipment power needs. Telephone communication lines will need to be installed in process area. Communication lines for Fire Alarm "Pull-Boxes" will be required for Tent #12 area.

2.3.1 Are the required services and utilities available?

- Electrical Power requirements will necessitate an electrical power feed tap of a 13.8KV overhead line, run to tent with the installation of 600KVA transformer and 480V power panel. A step-down transformer off power panel for lighting and receptacles will be part of this electrical up-grade.

2.4.1 Describe any special temperature or humidity requirements.

- Winter design temperature (55 degrees Fahrenheit). Cooling for worker comfort levels to be determined (ventilation).

3.1 Process Description

3.1.1 Major process flow

- Transfer of pondsludges from interim storage tanks on 750 pad to the treatment unit located on 750 pad.
- Storage and feeding of treatment additives (lime, portland cement, and flyash).
- Mixing blending of Sludges with additives.
- Treated waste storage/curing and acceptance testing to OU4 WAC.
- Treated waste transfer into the OU4 Closure work area.
- The sludges are to be removed from interim storage tanks located on 750 Pad and pumped into a process facility located on 750 Pad. The Process facility will treat the sludges by the addition of lime, cement, and flyash, to meet the Waste Acceptance Criteria defined in the IM-IRA/DD for disposition under the cap during the closure of OU4. The facility will be designed to deliver treated and cured sludges in a just in time manner to facilitate placement into the closure. The process facility will deliver the treated sludges to the closure area. (Final placement is to be accomplished by others).

3.1.2 Describe the characteristics of the inputs and outputs (phase, temperature, pressure, pH, composition weight, size, etc).

- Input materials: Approximately 800,000 gallons of aqueous sludges containing liquid, undissolved solids, and dissolved solids. The sludges are defined as 207 A/B Pond sludges (combined), 207C Pond sludges, and B788 Clarifier sludges. The three identified sludges differ in both physical and chemical composition. The sludges are classified as low level mixed waste. Additives are pozzolanic materials, portland cement, lime, and flyash. Operating temperatures are to be ambient, above 35 Degrees Fahrenheit. The pH range is 9 to 10.

- Output materials: The treated sludges product is described as friable material. This material will resemble loose dirt as opposed to a slab or monolith. The total planned product volume will be approximately 10,000 cubic yards (uncompacted). The pH will be from 10 to 12.

3.2 Capacity requirements

3.2.1 Describe the feed and product rates for the overall and individual processes.

- Normal sludge recovery and input to process treatment: 5,000 Gallons per 10 hour work day. Normal additive consumption rate 100 tons per day.

3.2.2 Is excess capacity required for the overall or individual processes? How much?

- No excess capacity is required.

3.3 Storage and Handling Requirements

3.3.1 Are there any feed, product or interim storage requirements?

- Additives:
  Cement bulk storage and delivery: 50 tons/day Lime bulk storage and delivery: 10 tons/day
  Flyash bulk storage and delivery: 50 tons/day.

- Treated product:
  125 tons day, covered storage, 24 hour cure, Delivery rate to OU4, 125 tons/day.

3.3.2 Residence time for storage; Handling requirements.

- Treated product must be cured for 24 hours in a covered container at an ambient temperature of not less than 35 degrees fahrenheit. Product must be tested for WAC acceptance prior to release for deliver.

4.1 Operating Assumptions

4.1.1 How many operating shifts per week, weeks per year?

- The pondsludge treatment processing operation is to have a total duration of approximately seven months or (156) calendar days. One shift will be ten hours per day, consisting of two crews, with a two hour crew overlap. The operation will consist of five days per calendar week.

4.1.2 Describe planned outages.

- The operation does not expect any planned "outages". Preventative Maintenance Orders (PMO's) and emergency maintenance will be accomplished by four full-time maintenance personnel during operating shift hours.

4.2 Operating Provisions

4.2.1 Describe requirements for startup, normal operating and shutdown conditions.

- Construction Component Testing (CC)/System Operations Testing (SO), Hot Process Qualification. No "Permacon" is required, because the Process is housed in Tent #12. Some process activities will require anti "C" personal protection equipment and full respirator. Normal shut down at the end of the rotating shift.

4.2.2 Describe requirements for standby, emergency, and infrequent operating conditions.

- Battery-powered Emergency Lighting will be provided for egress. Portable radios assigned to the process are for emergency communications (e.g. Fire Department, Building Emergency Support Team (BEST), Hazmat and Security).

4.2.3 Is there a need for uninterrupted operation?

- No, however catastrophic power failure could cause a detriment to the equipment (e.g. potential clogging of process waste lines). An emergency generator is required as a backup power source.

4.2.4 Describe equipment accessibility requirements and locations of other items in relation to the equipment.

- TBD

4.2.5 Describe any design features deemed to assist operations.

- TBD

4.2.6 Describe required or desired operator training.

- Operators will have all required plant training. An Operations Manual will be supplied by contracted design. A/E will train operators through on-the-job training, as specified in the Statement of Work (SOW) of the Construction Contract

4.2.7 Describe required documentation.

- Operations Manual (Procedures), Process Control Records, Waste Acceptance Criteria (WAC) Verification Records.

5.1 Equipment and Controls

5.1.1 Provide a description of the process equipment.

- A complete listing and description of the process equipment for the Pondsludge Treatment System is attached as Table Appendix B.

5.1.2 Provide a description of the types of controls required or desired.

- The Pondsludge Treatment System features the following instrument control loops:

  - One (1) treatment additive feed rate logic controller
  - Seven (7) level control systems
  - One (1) temperature control system

- The treatment additive feed rate logic controller maintains a manually-set water-to-pozzolan (W/P) ratio by automatically computing the necessary weight of treatment additives (pozzolans and hydrated lime) based upon the flow and moisture content of the pond sludge feed and by adjusting accordingly the feed rate of these treatment additives. The treatment additive feed rate logic controller is mounted in the local MBTU Control Panel. This controller receives input from the SFU in-line pond sludge flow meter and solids analyzer and sends a control output to the variable-speed drives of the ASFUs Additive Feed Systems.

- Each level control system monitors the level of a tank's contents and automatically starts and stops equipment, such as pump or conveyor, at set content levels. Tanks where level is monitored and controlled include the SRTU Sludge Removal System discharge hopper, the SFU Sludge Feed Tanks and Process Water Tank, the ASFUs Storage Silos, and the MBTU Mixer Flush Water Tank. Each level control system consists of a tank-mounted level-measuring element (ultrasonic or resistivity type), a local level transmitter, and a level indicator-controller mounted in the appropriate local unit control panel.

- The temperature control system regulates the water temperature inside the SFU Process Water Tank. The system consists of a tank-mounted thermocouple temperature-measuring element, a local temperature transmitter, and a local temperature indicator-controller.

5.1.3 Is redundant equipment or processor required?

- Equipment and control redundancy is not required for the Pondsludge Treatment System.

- Some equipment redundancy is provided such as two SFU Sludge Feed Tanks, Sludge Feed Tank Mixers, and Sludge Feed Pumps and two Pozzolanic ASFUs. However, redundant equipment is not provided for stand-by/spare purpose. In the case of the SFU, redundant equipment is provided to allow for a fill-and-draw batch type of operation. In the case of the

Pozzolanic ASFUs, redundant equipment is provided to allow for the feed of either a pre-mixed pozzolanic blend or separate pozzolanic additives.

5.1.4 What are the single failure points?

- The most likely single failure points for the Pondsludge Treatment System are the field-mounted instrument probes. These probes require regular and frequent cleaning, maintenance, and calibration to provide trouble-free operation.

5.1.5 Are there software requirements? Who will develop and test the software?

- Process control software requirements of the Pondsluge Treatment System are minimal. All instrument control logic software, including that for the control of treatment additives feedrate, are readily available and will be provided by the instrument vendor. Software will be shop-tested by the instrument vendor and field-tested by the installation contractor under the supervision of a vendor's representative.

5.2 Testing Provisions

5.2.1 Is sampling and testing required?

- Yes, per Batch (Process Control, WAC). Paint Filter Test acceptance prior to shipment to closure area.

5.2.2 What types of records and verifications are required during operations?

- Sampling records and verifications include (WAC), process control samples, and production records.

5.2.3 What are the calibration requirements?

- TBD

5.3 Maintenance Provisions

5.3.1 Describe equipment accessibility requirements.

- TBD

5.3.2 Describe required preventive maintenance.

- TBD

5.3.3 Will maintenance be performed remote or manual?

- Manual, maintenance on stationary equipment.

5.3.4 Are any special tools or unusual spare parts required for maintenance?

- TBD

5.3.5 Describe requirements for preparing for maintenance, dismantling and repair

- TBD

5.3.6 Is the manufacturer's technical services expected to be required?

- No

5.3.7 What is the allowable downtime for repair/preventive maintenance?

- Off Operations Schedule, approximately 13 hours per day, except for emergency.

6.1 Interrelationship with other processes

6.1.1 Describe any processes which either feed into or are fed by this process.

- This process supplies material to the OU4 contaminated media blending and placement

6.1.2 What other facilities (besides utilities) must be operating for this process to operate?

- OU4 closure operations

6.2 Interrelationship with other facilities

6.2.1 Describe the relationships between this process and other facilities.

- NONE

6.2.2 What other facilities must be operating (besides utilities) for this process to operate?

- NONE

6.3 Interrelationship with support services

6.3.1 What support services are required both during and after installation?

- Lab Technicians (Sample Management Office), Trucking, Radiological Control Technicians, Radiological Engineering, Industrial Hygiene, Chemical Operators.

6.3.2 Describe any outside (non-RFP) support services required.

- Contracted Independent Professional Engineer (Design/Construction verification and RCRA compliance), Title II Design Engineering for initial process startup support.

7.1 Radioactive Materials

7.1.1 Describe any radioactive materials to be generated or handled.

- Pu, Am, U (low level)

7.1.2 Describe how it will be handled, packaged, treated, stored, transported, and disposed.

- Pondsludge to be pumped from storage tanks, treated chemically and mechanically, transferred from process treatment facility to roll-off containers, and transported to OU4 Closure Area.

7.2 Hazardous Materials

7.2.1 Describe any hazardous materials.

- TBD

7.2.2 Describe how it will be handled, packaged, treated, stored, transported, and disposed.

- See 7.1.2

7.3 Mixed Materials (Hazardous and Radioactive)

7.3.1 Describe any mixed materials expected to be generated during construction of final operation.

- Low-Level Mixed Waste

7.3.2 Describe how it will be handled, packaged, treated, stored, transported, and disposed.

- See 7.1.2

8.1 Radioactive Waste

8.1.1 Describe any radioactive waste.

- Process equipment, tools, storage tanks.

8.1.2 Describe the disposition of this waste.

- TBD

8.2 Hazardous Waste

8.2.1 Describe any hazardous waste.

- TBD

8.2.2 Describe the disposition of this waste.

- TBD

8.4 Regulatory requirements

8.4.1 What documentation is required?

- The primary documentation to meet regulatory requirements is (1) the IM/IRA/EA Decision Document, which has been released to public comment and will be completed by early FY96, and (2) Title II design, which is scheduled to be completed early in FY96. These documents will fulfill RCRA and NEPA documentation requirements.

- Secondary documents which are produced to provide input to the Decision Document are:

Deliverables specified in the Brown & Root contract

- White Papers (1) for Sludge
- CDRs (1) for sludge treatment
- Treatability study report (1)

The Brown & Root Title II package will be used to provide final waste-form information for the closure Title II package and as a submittal to the State of Colorado.

8.4.2 What permits are needed or affected?

- A RCRA Temporary Unit permit is required (as modification to the site's RCRA permit) and has been applied for as part of the Decision Document.

- The site's Clean Air Act permit could be affected; this will need to be evaluated with the CAA subject experts as soon as the CDRs are available.

- APENs or air-emissions permits for the sludge units will be required.

- No construction storm-water run-off permit will be required, since the treatment units will be installed on the 750 and 904 Pads (which have run-on/run-off engineered controls already installed).

- No excavation is anticipated.

8.4.3 Are there any design features required to meet any regulatory requirements?

- Yes. Design features must meet the requirements for RCRA Subpart J treatment units, as described in the Decision Document. In particular, the units must be sized such that operation can be completed within the twelve-month permit window.

- Must also meet the needs for radioactive air emissions monitoring.

9.3 Industrial Hygiene

9.3.1 Describe any known Industrial Hygiene hazards.

- Potential chemical hazards needed to be controlled (B and C pond sludge).

- Metals - Pb, As, Cd, Cr, Bc most abundant and/or hazardous also Ba, Al, Ni, Ag, Hg.

- Other potential chemical hazards present in characterization nondetected in air samples: tetrachloroethylene, 1,1,1 trichloroethane, trichloroethylene, 1,1,2 trichloro, 1,2,2 triflouroethane, MEK, Benzene, Ammonia. CO has been a concern where using has and diesel powered fork lifts to move metals in tent. Chemical additives used in the process may be a hazard to control (e.g. CaOH, CaO).

- Physical hazards - there is a potential for heat and cold stress during the corresponding seasons. Noise may be a potential source during shredding operations. Industrial Hygiene may have to review all equipment specs to address potential noise issues. Ergonomic concerns may arise during lifting operations (e.g. hose used for vacuuming).

9.3.2 Describe any design features required for Industrial Safety.

- Ventilation systems may be required if the system is not designed to be totally enclosed. Ventilation may also be required at various sampling points in the system and/or entry or exit ports for the product feeding stations.

9.4 Industrial Safety

9.4.1 Describe any Industrial Safety hazards.

9.4.2 Describe any design features required for Industrial Safety.

9.5 Safety Analysis

9.5.1 Define the allowable exposure to personnel of radiological or toxic materials.

- ACGIH allowable exposure levels, 8 hours TWA:

COC	TWA mg/m^3
Pb	.15 mg/m^3
As	.01 mg/m^3
Cd	.01 mg/m^3
Cr	.5 mg/m^3
Be	.002 mg/m^3
Ba	.5 Hexavalent Chrome (.05 mg/m3)
Al	10 mg/m^3
Ni	1 mg/m^3
Ag	.1 mg/m^3
Hg	.1 mg/m^3
NH_3	17 mg/m^3

- Heat and cold stress - need to be evaluated at operational conditions.
- Noise, 85 dBA/8 hr TWA.
- Industrial Hygiene to review MSDS of all additive materials.

9.5.2 What are the required structural classifications?

Process additives allowable exposures, ACGFH, 8 hour TWA

COC	8 hour TWA
CaOH	5 mg/m^3
CaO	2 mg/m^3
Si	1 mg/m^3

9.5.3 Describe the impact to the Limiting Conditions of Operation as identified in the Building Operational Safety Requirements.

9.5.4 Determine need to complete a safety analysis.

- Required, minimum requirement (Safety Screen). Revision to 750 Pad SAR

9.6 Fire Protection

9.6.1 Describe any fire hazards and their control requirements.

- TBD

9.6.2 Describe any design features required.

- TBD

9.7 Environmental Protection and Pollution Control

9.7.1 Describe all required documentation.

- (See 8.4.1 and 8.4.2)

9.7.2 Describe effluents and emissions.

- No liquid effluents are expected from the operations. Clean and rinse water will be generated from the closure of the units. That rinsate is expected to be contaminated with very low levels of heavy metals and radionuclides; and to have pH between 7 and 9. Because the waste is F-listed, we expect the rinsate will need to be transferred to Building 374 for treatment.

- Air emissions will include criteria pollutants from the haul trucks (engines and from the dirt roads).

- Air emissions from the treatment units will be primarily dust from the reagents (cement and lime) with very small undetectable amounts of hazardous and radioactive constituents.

9.7.3 Describe design features for environmental protection.

- (See 8.4.3)

9.7.4 Describe countermeasures for spills, etc.

- Since the treatment units will be installed on the storage pads, standard existing operations procedures will be used. The treatment processes will not vary in any substantial way that effects spill control from current operations. Double containment, e.g. (spill traps and pans). Covering of roll-off containers used for transport of treated waste.

10.1 Impacts to Operations

10.1.1 Describe any expected impacts to operations during construction and testing.

- N/A

10.1.2 Describe any expected impacts to operations during startup.

- Hot Qualifying Testing will contaminate equipment.

10.2 Environmental Considerations

10.2.1 Describe any known unusual impacts to the environment during construction and testing.

- N/A

10.2.2 Describe the relationship of this project to future projects.

- N/A

11.1 Other projects in Construction.

11.1.1 Describe other projects which are in Design or construction in the near vicinity at the same time.

- OU4 Closure Program.

11.1.2 What common design feature could be utilized.

- N/A

11.2 Future Projects

11.2.1 Describe the relationship of this project to future projects.

- RFETS D&D and OU4 site closure action.
- OU-5 Pit ash treatment and disposal.
- This system is a candidate to treat other sludge waste forms at RFETS.

11.2.2 Are there any design features which need to be considered with respect to future projects.

- All systems must consider ease and expense of decontamination and removal/disposal. This is a temporary facility with a scheduled life of less than one year.

12.1 QA Considerations

12.1.1 What are the anticipated non-weapons Quality Assurance Levels for the design, construction, startup, operation, testing, and maintenance of this project?

- N/A (see COEM 6.3.6)
- System Classification "SC-3"

12.1.2 What are the product QA requirements?

- WAC in 40 CFR
- (See 8.4.1 and 8.4.2)

13.1 Nuclear Material Physical Safeguards

13.1.2 Describe requirements for locks, detection and alarm, and remote surveillance.

- N/A

13.2 Nuclear Material Accountability

13.2.1 Define the methods of measurement and recording.

- N/A

13.2.2 What is the inventory frequency, method, and duration?

- N/A

13.3 Security

13.3.1 Describe protection of classified information and materials.

- N/A

13.3.2 Describe any special security requirements or access issues.

- Working within a specially designated "Red Badge" area inside the Protected Area (PA). Pondsludge processing "security plan" to be provided.

14.1 Local Requirements

14.1.1 Describe the visual communication requirements.

- N/A

14.1.2 Describe the audio communication requirements.

- Portable Radio Communications.

14.2 Communication Requirements

14.2.1 Describe number of telephones, LAN, phone lines for computers, guard phones, plant PA system.

- Three telephone lines to be installed at the process treatment location. Telephone lines for use in proximity of treatment area are: 1) Portal #3 2) Security (Guard Shack) on 750 Pad at entry from PA.

14.2.2 Describe all alarms required not described elsewhere.

- Fire Alarm Pull Stations are to be located in the Tent #12/Process Treatment Facility. Portable Air Monitors are also to be used in the Process Treatment Area.

14.2.3 Have protective force communications been considered?

- Yes. a security plan is to be provided. A full-time armed security force is to be provided.

15.1 Scope of DD&D Prior to Construction

15.1.1 Describe any DD&D work involved.

- Upon deactivation, all process treatment equipment will be decontaminated (e.g. equipment, tanks, drums and crates).

15.1.2 What are the levels and type of contamination?

- See 7.3.1

15.1.3 What is the expected quantity of waste generated?

- TBD

15.1.4 List of equipment to be salvaged.

- TBD

PART III

APPENDIX H

ENGINEERING AND PROJECT MANAGEMENT WORK PLAN

ENGINEERING AND PROJECT MANAGEMENT

WORK PLAN

FOR

GREATLY ACCELERATED SLUDGE (GASP), and

INVENTORY PONDCRETE PROCESS.

(REVISION 2)

WORK PACKAGE ACTIVITY I.D. 12189

DATE: February 3, 1995

Prepared by: D.W. Few,
SPP Project Engineer.

CONCURRENCE:

Thomas D. Beckman

Work Package Manager

TABLE of CONTENTS

SECTION		PAGE
1.0	Project Summary	1
1.1	Purpose	1
1.2	Scope	1
1.3	FY 95 Assumptions	2
2.0	Project Execution	2
2.1	Baseline Documentation	2
2.2	Design Deliverable Products	2
2.3	Work Plan	3
2.4	Performance Criteria	3
3.0	Project Organization	4
3.1	Resources	4
3.2	Subcontracting Strategy	4
3.3	Engineering Review Requirements	5
4.0	Work Breakdown	5
4.1	Project Engineers Responsibilities	5
5.0	Estimates	5
5.1	Engineering & Technology Support Services	5
5.2	Contingency	5
5.3	Project Design Hours Estimate	6
6.0	Definitions	8

RECORD OF REVISIONS:

* Revision 0, dated 17 Nov 94
** Revision 1, dated 4 Jan 95
*** Revision 2, dated 3 Feb 95

1.0 Project Summary

1.1 Purpose:

The purpose of this plan is to identify all requirements to complete the Design elements of the proposed "Process Trains for treating Solar Ponds Sludge & Inventory Pondcrete", which includes supporting the following FY95 activities. The Solar Pond Projects (SPP) (Work Package #12189) Work Breakdown Structure (WBS) identifies design activities requiring support from subcontract or by Rocky Flats Environmental Technology Site (Site) Engineering & Project Management staff. This plan summarizes the various elements and responsibilities in support of the W.B.S. & performance schedule.

W.B.S. (activities)- S1200 Sludge Conceptual Design Report, S1300 Sludge Pre-Title II Design Support, S1400 Sludge Title II Design, S1600 Tent #12 Improvements, R1200 INV Pondcrete Conceptual Design, R1300 INV Pondcrete Pre-Title II Design, R1400 Inv Pondcrete Title II Design, R1600 Tent #11 Improvements.

1.2 Scope (Engineering Work Plan/Work Breakdown Schedule Tasks)

* **S1200**

  Task 1. To perform Site Engineering review of Conceptual Design Report (CDR) Drafts (90%).

  Task 2 Issue (90%) CDR review comments to S/C. design as needed for the Pond Sludge Treatment Process.

* **S1300**

  Task 1. Site definition and development of operational requirements for processing Solar Ponds Sludge being stored on 750 Pad of Operating Unit 4 (OU-4). (PONDSLUDGE) Operations Requirement Document (ORD).

  Task 2. Engineering and Project Management (E & PM) prepare Engineering Work Plan.

* **S1400**

  Task 1. Solar Ponds Sludge treatment process A/E Title II design reviews performed by Site Design Team at 30%, 60%, 90% & 100% with established Department of Energy (DOE) and Site standards regarding Safety, Quality, Environmental and Engineering requirements.

* **S1600**

  Task 1. Tent # 12 Improvements. To prepare the design of improvements to Tent # 12 as needed. This includes Conceptual, Title II & Title III (definitive & As-Built designs)

* **R1200**

  Task 1. To perform Site Engineering review of CDR Draft (90%).

*R1300

Task 1. Site definition and development of operational requirements for processing Inventory Pondcrete being stored on the 904 Pad. (Pondcrete) ORD.

*R1300

Task 2. E & PM prepare Engineering Work Plan.

*R1400

Task 1. Solar Ponds Pondcrete treatment process A/E Title II design reviews performed by Site Design Team at 30%, 60%, 90% & 100%, with established DOE and Site standards addressing Safety, Quality, Environmental and Engineering controls.

*R1600

Task 1. (Tent 11 Improvements). Site Design Team to prepare the design of improvements to Tent #11 in support of process treatment to be physically located in Tent #11. (e.g. Permacon Removal.) All designs include Conceptual, Title II & Title III (definitive & As-Built).

1.3 FY 95 Assumptions

- Award of Contract, on schedule with Solar Pond Projects (SPP) with BCP-1, A5H Design of Title II for Sludge & Pondcrete process facilities.
- Title II Process Designs (Sludge & Pondcrete) 50% complete in FY 95.
- Existing electrical power survey, and power modification request to be completed (Sludge & Pondcrete) prior to Title II approval.
- If required, "Space" issues for both process trains (e.g., Tent areas for processing, Laydown storage) will be resolved by Site Management.
- Project Design Hours Estimate (PDHE) based on limitation of design definition at time of estimate. Additional resources may evolve as Designs progress from conceptual through Title II, (Pre-CDR).

2.0 Project Execution

2.1 Baseline Documentation

- "Sludge" White Paper -Rev 1.
- "Pondcrete" White Paper
- Existing 750/904 Pad drawings
- Existing 750/904 Tent drawings
- Accelerated Sludge Remediation Process (ASRP) existing equipment list
- ASRP project files
- Inventory Pondcrete project files (prior efforts)
- Pondcrete equipment drawings and specifications

2.2 Design Deliverable Products

- All deliverables to be specified in A/E Title II Statement of Work (SOW)
- Design basis document
- Drawings
- Construction specifications
- Equipment specifications: Per Conduct of Engineering Manual (COEM) Standards
- Equipment drawings
- Equipment manuals
- Design calculations
- Construction Component Testing (CC)/System Operations Testing (SO) Test requirements
- Operations Requirement Document (ORD)

2.3 Work Plan

- Pre-Title II design support to be completed by EG&G Engineering Design Team.

  1. Tent #12 Heat and Lighting Design Package
  2. Electrical Power Survey (904 & 750 Pads)
  3. Site Study for 904 Pad requirements
  4. Electrical requirement designs, A/E to specify and design all connections to process equipment and all controls. EG&G Electrical Design for all distribution and supply panels,e.g. 480/280 (XX circuits XXX amps).
  5. Existing equipment modifications & removals, if needed , will be designed by Site Design Team.
  6. Site design support to be completed within schedule, scope and funding baselines.
  7. Not yet determined ESR's; in support of Work Package (12189).

2.4 Performance Criteria

1. EG&G design support consistent with approved Work Package Cost & Schedule.
2. The Title II "SOW" to establish contractual responsibility with respect to which "design elements" are to be performed by which contributor, subcontractor or Site design team.
3. All designs will conform to applicable specification, as determined in SOW.
4. Technical criteria for design for environment, Resource Conservation and Recovery Act (RCRA), CRS 264 Subpart J and 264.553

5. Safety and health requirements, Occupational Safety and Health Administration (OSHA), Colorado Department Public Health and Environment (CDPHE), Environmental Protection Agency (EPA), & Site As Low As Reasonably Achievable (ALARA) requirements.

6. DOE 6430.1A (Temporary Facility)

7. National Electric Code

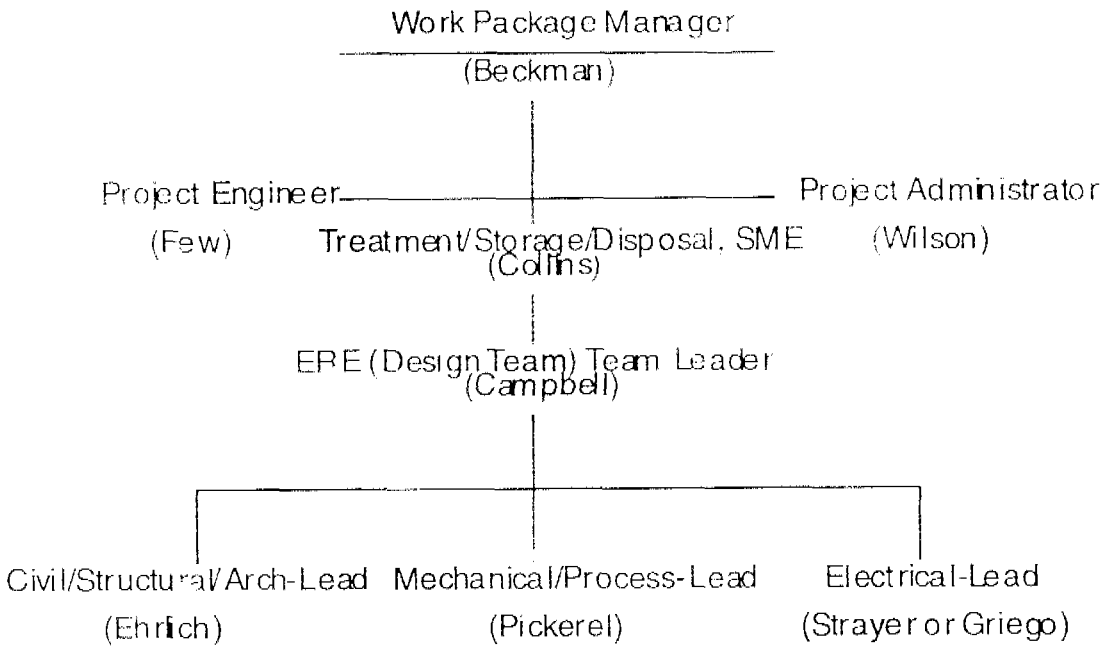
8. National Fire Protection Association (NFPA) Compliance.

9. Site, COEM & CCCP.

10. Accepted Environmental Standards.

3.0 Project Organization

3.1 Resources



3.2 Subcontracting Strategy

Scope of Subcontracting A/E design for WP 12189.

- A/E contract for CDR.
- A/E contract for Title II & III design for Pondsludge Process Facility.
- A/E contract for Title II & III for Inv. Pondcrete Process Facility.

** It is assumed all "Physical Plant" designs and utilities required will be completed by RF design team.

*** All Equipment for process trains to be designed by Title II A/E,and to be procured & installed by Construction Subcontractor per specifications & acceptance QA requirements per 100% Title II.

3.3 Engineering Review Requirements per: COEM 2-D16-DES-207/12.

- Engineering comments
- Inventory Pondcrete White Paper Engineering Information & comments.
- Pondsludge White Paper Rev.1 Engineering Information & comments.
- 90% CDR Site Engineering Review.
- 30/60/90% Title II Site Engineering Review.

4.0 Work Breakdown (Ref:W.B.S. WP 12189- Sub-activity)

4.1 Project Engineer Responsibilities

- Prepare Engineering Workplan. **(S1300,R1300)**
- Prepare System Classification determination. **(S1200,R1200)**
- Coordinate design effort between A/E and RFP.**(S1400,R1400)**
- Preparation of ORD document for plant review.**(S1200,R1200)**
- Identify and issue ESR's in support of GASP.**(S1400,R1400)**
- Issue CDR for plant review on (EO).**(S1200,R1200)**
- Coordinate Title II design submittal from A/E and issue for review cycle with RFP principals. **(S1400,R1400)**
- Scope and prepare GES design packages in support of "Process Trains"**(S1400,R1400)**
- Issue to Environmental Restoration Engineering for approval, Subcontractor drawings, specifications and design calculations at 100% Title II. Obtain Engineering Manager Sign-offs. **(S1400,R1400)**
- SOW development support. **(S1300,R1300)**
- Purchase requisition technical support.**(S1300,R1300)**
- Prepare PDHE. **(S1300,R1300)**
- Existing Equipment Evaluations **(S1300,R1300)**

5.0 Estimates

5.1 E&T Support Services

5.3 Contingency

- This work plan does not include Engineering Service Requests not yet defined in Pre-Title II scoping. If additional design is identified, SPP Project Management to include in BCP.

5.3 PDHE

ERE PDHE FOR SLUDGE

TASK	COST CENTER 280	COST CENTER 281	COST CENTER 282	COST CENTER 3082	
	HOURS	HOURS	HOURS	HOURS	TOTAL
	PE	CE	ME	LEAD	
CONCEPTUAL DESIGN	92	96	96	40	324
Support/Review ORD	8	12	12		32
System Classification	4	4	4	4	16
50% Review	16	12	12	8	48
Review Equipment List	8	8	8		24
Review DWG/Spec List	8	8	8		24
90% Review	48	48	48	24	168
Review Treatability Study		4	4	4	12
PRE-TITLE II SUPPORT	230	120	198	124	672
Support EWP/PDHE				20	20
Tent #12 Modifications					*392*
Scope & PDHE				16	16
Design (TL II)	112	40	120	24	296
Title III Support	36		36	8	80
Site Study					*132*
Scope & PDHE				12	12
Site Location		72		8	80
Power Survey/PMR	40				40
Existing Equipment Evaluation					*96*
Inventory/List	2		2	4	8
Obtain DWG/Specs	2		2	4	8
Inspect Equipment	12		12	8	32
Evaluation Report	18		18	12	48
Review TII Sow	8	8	8	8	32
TITLE II DESIGN (A/E)	350	340	350	100	1140
30% Review	85	80	85	20	270
60% Review	85	80	85	20	270
90% Review	120	120	120	40	400
A/E Support	60	60	60	20	200
TOTAL	672	556	644	264	2136

ERE PDHE FOR PONDCRETE

TASK	COST CENTER 280	COST CENTER 281	COST CENTER 282	COST CENTER 3082	
	HOURS	HOURS	HOURS	HOURS	TOTAL
	FE	CE	ME	LEAD	
CONCEPTUAL DESIGN	**100**	**96**	**96**	**48**	**340**
Support/Review ORD	16	12	12	8	48
System Classification	4	4	4	4	16
50% Review	16	12	12	8	48
Review Equipment List	8	8	8		24
Review DWG/Spec List	8	8	8		24
90% Review	48	48	48	24	168
Review Treatability Study		4	4	4	12
PRE-TITLE II SUPPORT	**78**	**92**	**38**	**76**	**284**
Tent 11					
Support EWP/PDHE				20	20
Site Study					*152*
Scope & PDHE				12	12
Site Location		88		12	100
Power Survey/PMR	40				40
Existing Equipment Evaluation					*96*
Inventory/List	2		2	4	8
Obtain DWG/Specs	2		2	4	8
Inspect Equipment	12		12	[illegible]	32
Evaluation Report	18		18	12	48
Review TII Sow	4	4	4	4	16
TITLE II DESIGN (A/E)	**288**	**288**	**288**	**88**	**952**
30% Review	60	60	60	16	196
60% Review	60	60	60	16	196
90% Review	120	120	120	40	400
A/E Support	48	48	48	16	160
TOTAL	**466**	**476**	**422**	**212**	**1576**
TOTAL SLUDGE + PONDCRETE	**1138**	**1032**	**1066**	**476**	**3712**

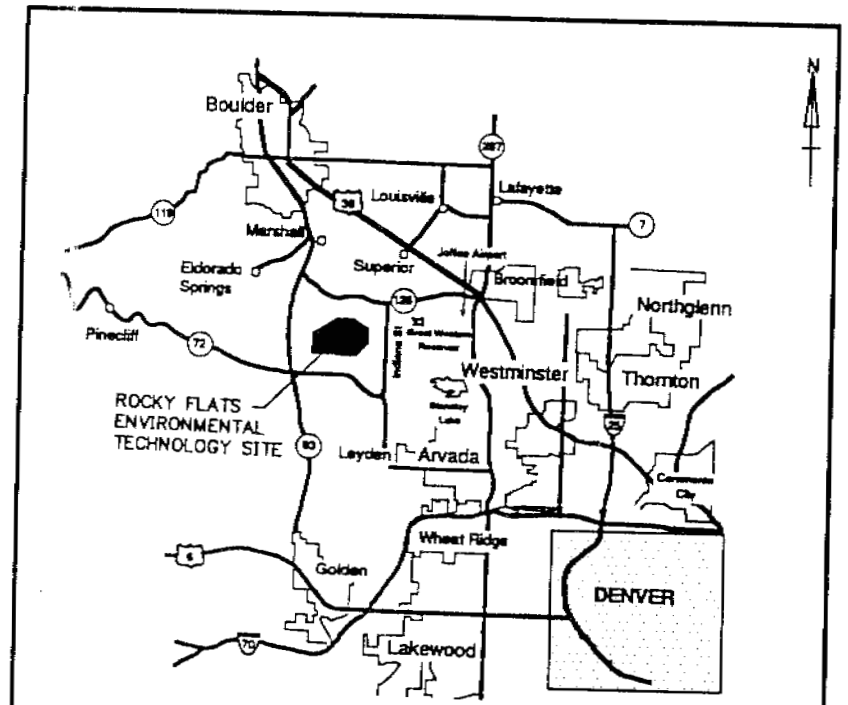
6.0 Definitions

ALARA	As Low As Reasonably Achievable
ASRP	Accelerated Sludge Remediation Process
BCP	Baseline Change Proposal
CC	Construction Component Testing
CDR	Conceptual Design Report
CCCP	Configuration Change Control Program
COEM	Conduct of Engineering Manual
CDHPE	Colorado Department Public Health and Environment
DOE	Department Of Energy
E & T	Engineering & Technology
E & PM	Engineering and Project Management
EPA	Environmental Protection Agency
ERE	Environmental Restoration Engineering
EWP	Engineering Work Plan
G.A.S.P.	Greatly Accelerated Sludge Processing
INV.	Inventory Pondcrete
ORD	Operations Requirements Document
OSHA	Occupational Safety Health Administration
PDHE	Project Design Hours Estimate
Pondcrete	Inventory "Solar Ponds" Pondcrete
SO	System Operations Testing
SOW	Statement of Work
SPP	Solar Pond Projects
Site	Rocky Flats Environmental Technology Site
Sludge	Inventory "Solar Ponds" Sludge
W.B.S.	Work Breakdown Schedule

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO
ACCELERATED POND SLUDGE PROCESSING
CONCEPTUAL DESIGN
CONTRACT NO. 225471001/ST3

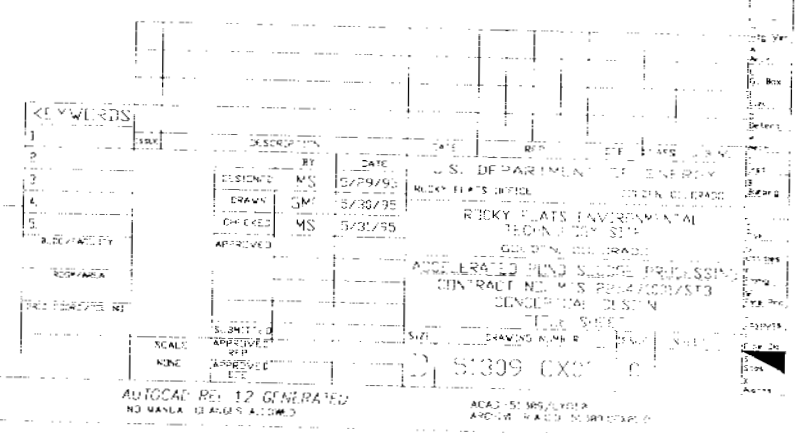
DRAWING INDEX

DWG NO.	DRAWING TITLE
51309 CX01	TITLE SHEET
51309 CX02	PLOT PLAN
51309 C201	GENERAL ARRANGEMENT
51309 C202	SECTIONS
51309 C203	SECTIONS
51309-CX03	LEGEND - PROCESS AND P & I DIA
51309-CX04	LEGEND - PROCESS AND P & I DIA
51309 C001	PROCESS FLOW DIAGRAM
51309 C002	PROCESS FLOW DIAGRAM
51309-C003	AREA 1000 - P & I DIAGRAM
51309-C004	AREA 2000 - P & I DIAGRAM
51309 C005	AREA 3000 - P & I DIAGRAM
51309-C006	AREA 4000 - P & I DIAGRAM
51309 C007	AREAS 5000/6000 - P & I DIAGRAM
51309-C701	ELEC. SINGLE LINE DIA. - MAIN SWITCH
51309 C702	ELEC. SINGLE LINE DIA. - AREA 1000
51309 C703	ELEC. SINGLE LINE DIA. - AREA 2000
51309 C704	ELEC. SINGLE LINE DIA. - AREA 3000
51309-C705	ELEC. SINGLE LINE DIA. - AREA 4000
51309 C706	ELEC. SINGLE LINE DIA. - AREA 6000



SITE LOCATION MAP

Halliburton NUS CORPORATION

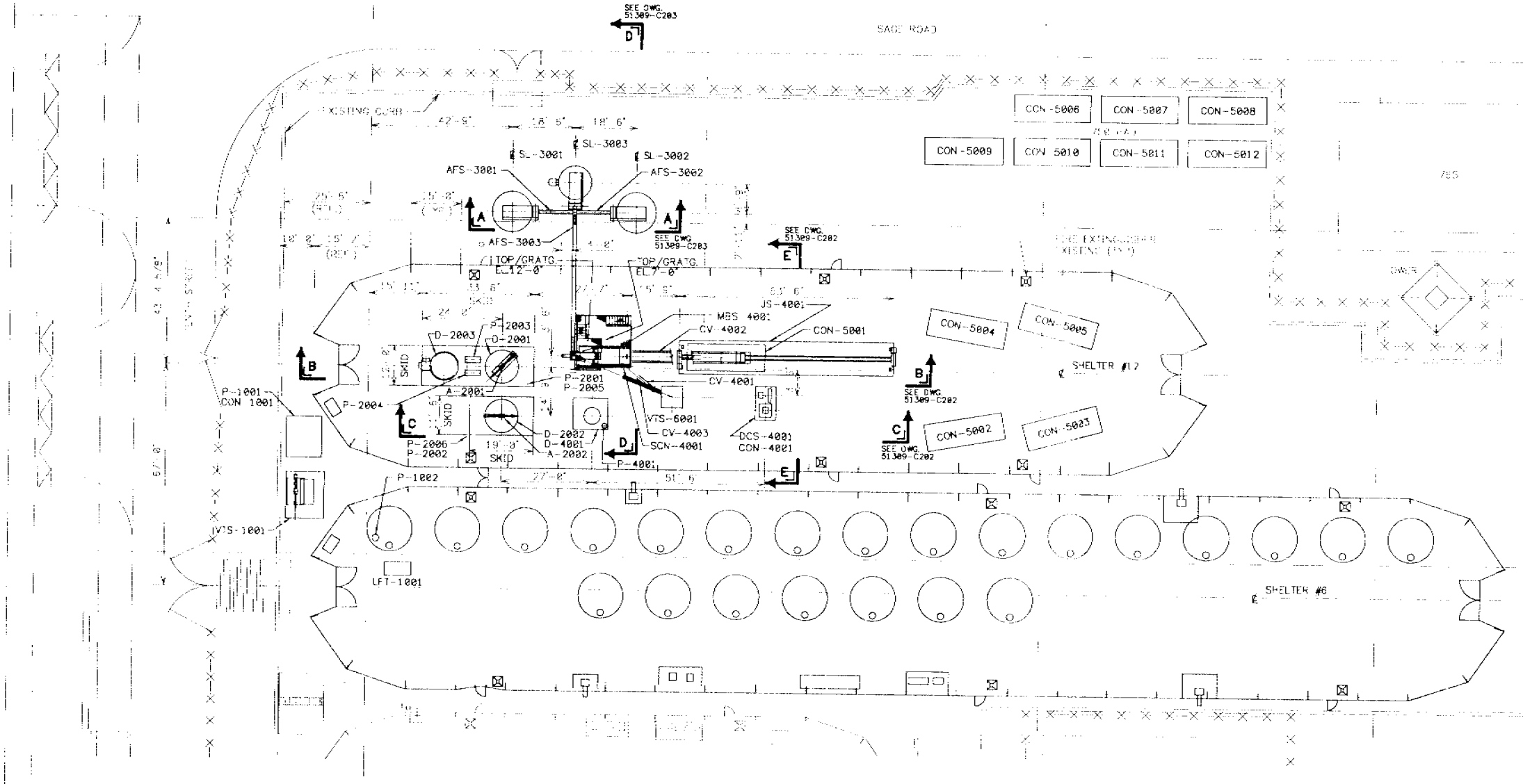


OU4
CLOSURE AREA

POND SLUDGE
TREATMENT
SYSTEM AREA

POND SLUDGE
INTERIM STORAGE
TANK (TYPICAL)

Halliburton NUS
CORPORATION



EQUIPMENT NO.	DESCRIPTION
VTS-1001	SLUDGE REMOVAL SYSTEM
P-1001	SLUDGE TRANSFER PUMP
P-1002	FLUSH SYSTEM SUBMERSED PUMP
LFT-1001	MAN LIFT
CON-1001	OVERSIZED WASTE CONTAINER
D-2001	SLUDGE FEED TANK 1
D-2002	SLUDGE FEED TANK 2
A-2001	SLUDGE FEED TANK MIXER 1
A-2002	SLUDGE FEED TANK MIXER 2
P-2001	SLUDGE FEED PUMP 1
P-2002	SLUDGE FEED PUMP 2
D-2003	PROCESS WATER TANK
P-2003	PROCESS WATER PUMP
P-2004	FLUSH WATER PUMP
P-2005	DECANT PUMP 1
P-2006	DECANT PUMP 2

EQUIPMENT NO.	DESCRIPTION
SL-3001,SL-3002	POZZOLANIC REAGENT STORAGE SILOS
AFS-3001,AFS-3002	POZZOLANIC REAGENT ADDITIVE FEED SYSTEMS
SL-3003	HYDRATED LIME STORAGE SILO
AFS-3003	HYDRATED LIME ADDITIVE FEED SYSTEM
MBS-4001	MIXING/CAPPING SYSTEM
SCN-4001	WASTE SCALPING SCREEN
CV-4001	FINES TRANSFER CONVEYOR
CV-4002	TREATED WASTE TRANSPORT CONVEYOR
JS-4001	CONTAINER JOCKEY SYSTEM
DCS-4001	DUST COLLECTION SYSTEM
CON-4001	DUST CONTAINER
D-4001	MIXER FLUSH WATER TANK
P-4001	MIXER FLUSH WATER PUMP
CV-4003	RECYCLE CONVEYOR
CON-5001,CON-5002	TREATED WASTE CONTAINERS
VTS-6001	TREATED WASTE RECYCLE SYSTEM

NOTES

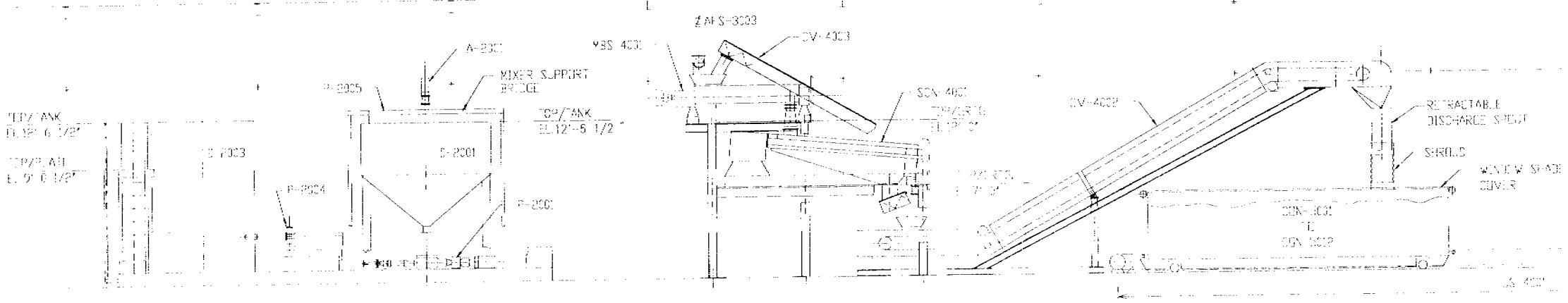
1) P-1001 (SLUDGE REMOVAL SYSTEM SUBMERSIBLE PUMP) IS LOCATED IN THE UNDERGROUND STORAGE TANK (NOT SHOWN).

Halliburton NUS CORPORATION

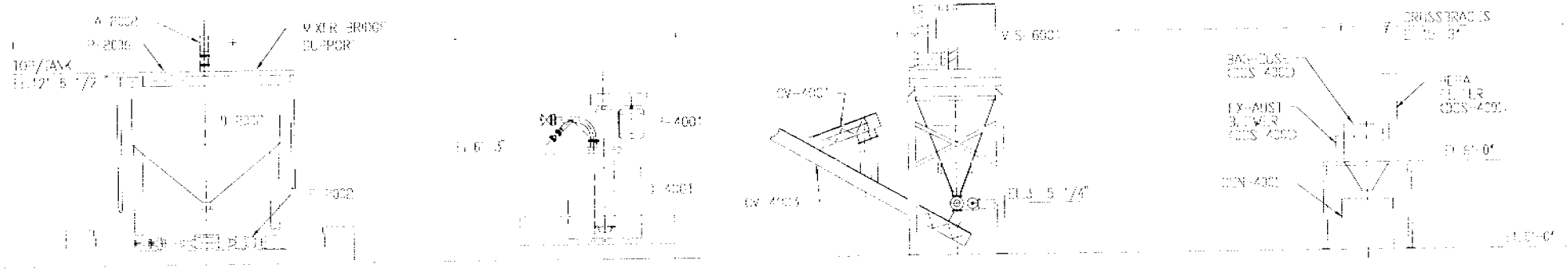
KLEINFELDER

DEPARTMENT OF ENERGY

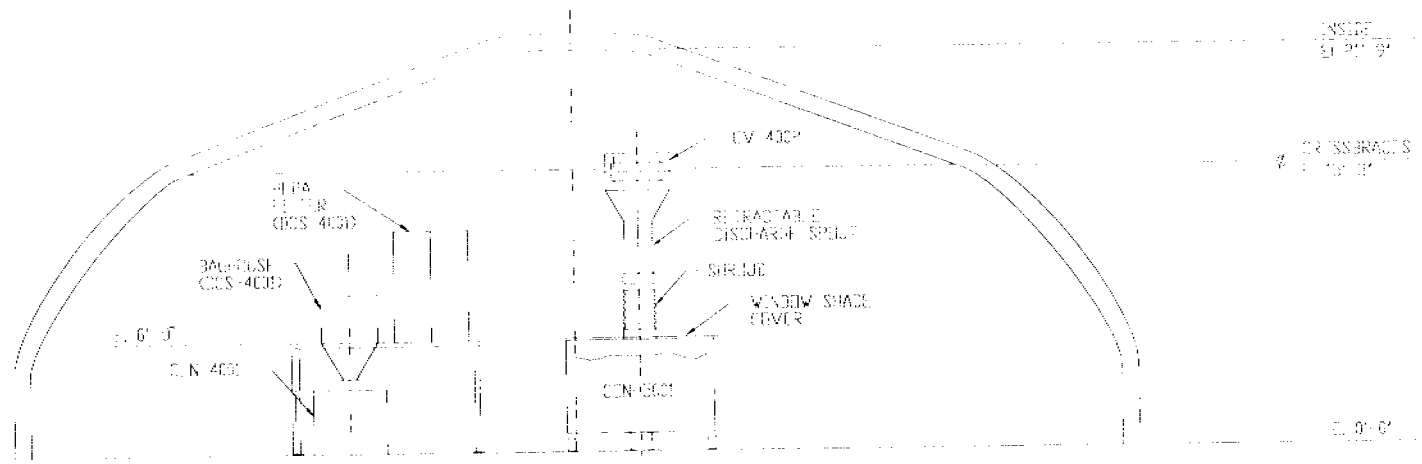
SHEET 1 OF 1



SECTION B-B



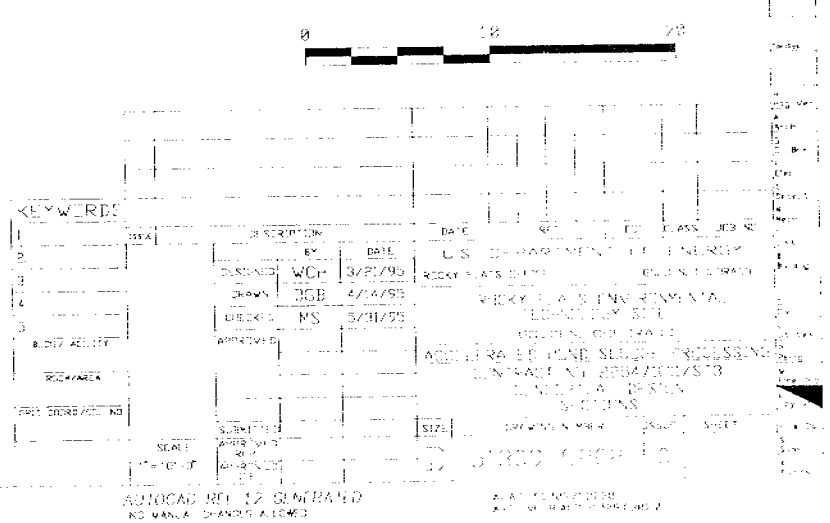
SECTION C-C

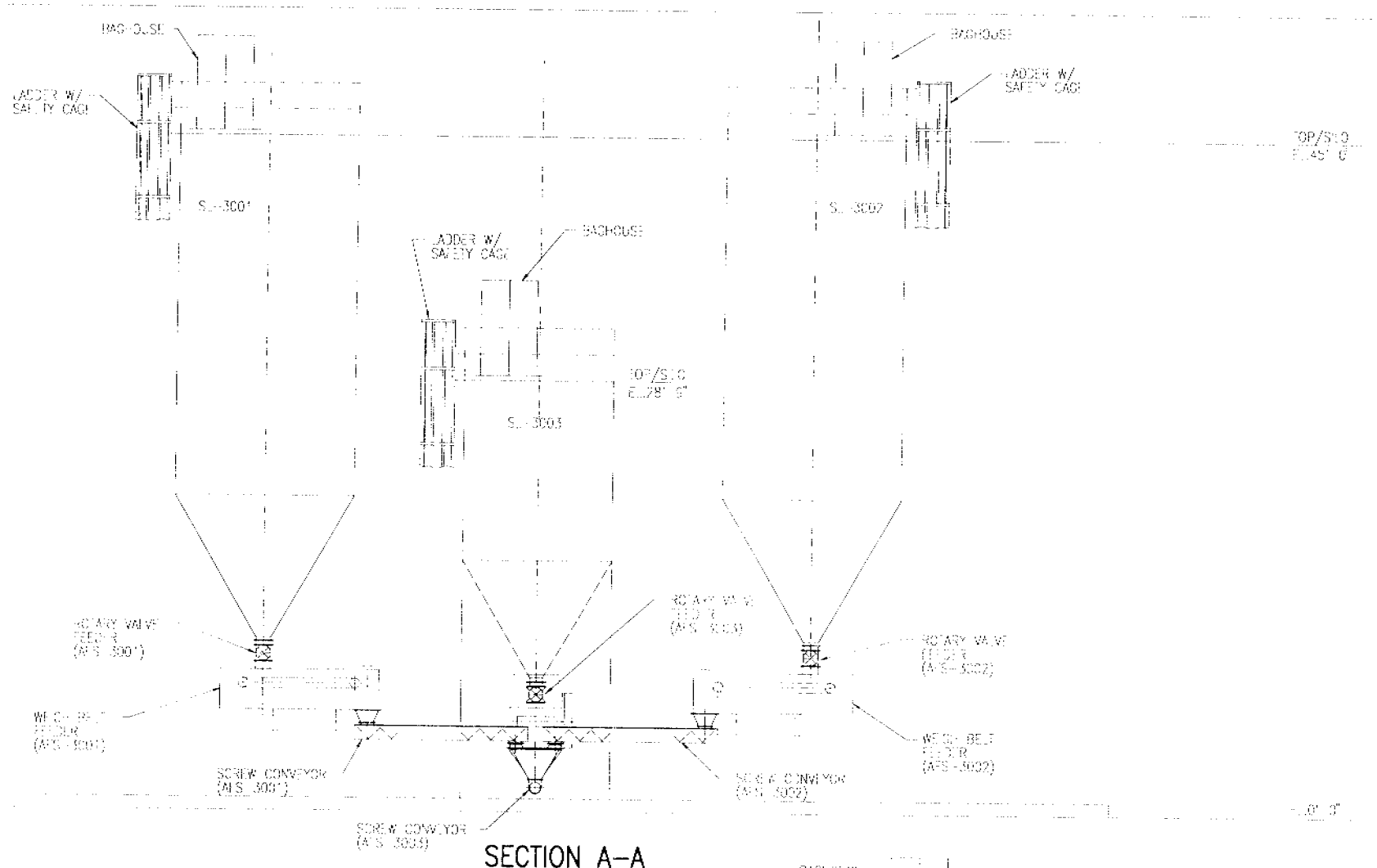


SECTION E-E

NOTES:

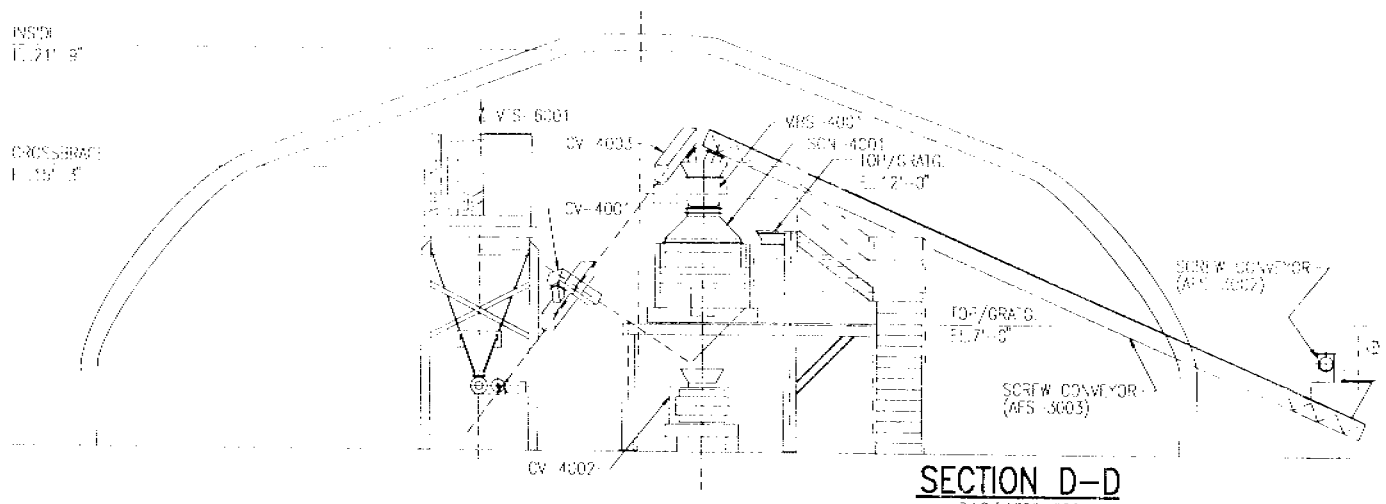
1) UV 4302 SHALL BE LOCATED BETWEEN SCN4301&2





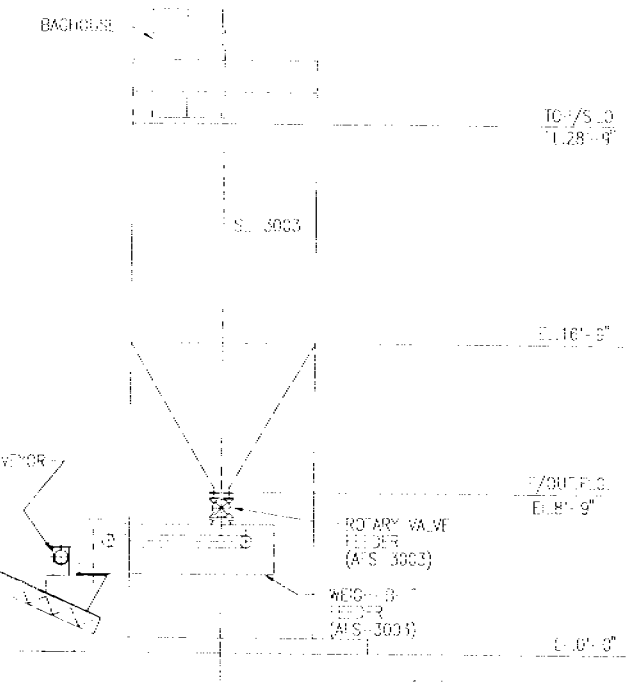
SECTION A-A

DWG 51309-0201



SECTION D-D

DWG 51309-0201



NOTES:

1. V.S. 6001, CV-4001, AND AFS 3003 SHALL BE LOCATED BETWEEN CROSS BRACES.

Halliburton NUS CORPORATION

0 10 20

SCALE IN FEET

KEYWORDS

DESIGNATE	BY	DATE
ENGR	WCH	3/21/95
CHK'D	JSB	4/14/95
APP'D	MS	5/30/95

U.S. DEPARTMENT OF ENERGY

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

ACCELERATED PIPE & DUCT REMOVAL

CONTRACT NO. DE-AC24-92ID13018

SIZE D

AUTOCAD REL 12 GENERATED

INSTRUMENT SYMBOLS

( ) LOCAL MOUNTED INSTRUMENT

( ) PANEL MOUNTED INSTRUMENT

(XXX / XXX) — INSTRUMENT TYPE PREFIX / TEP NUMBER

INDICATES FUNCTION / INDICATES INTERLOCK

PRESSURE GAUGE WITH SEAL

PID CONNECTION

[ESD] EMERGENCY STOP BUTTON

INSTRUMENT IDENTIFICATION PREFIXES

	INSTR PREFIX	ON/OFF	RECORDING (CONTROLLING)	INDICATING (CONTROLLING)	BLIND TRANSMITTER	RECORDING (READOUT)	INDICATING (READOUT)	SWITCH LOW	SWITCH HIGH	ALARM LOW	ALARM HIGH	VIEWING GLASS/GAUGE	ELEMENT
ANALYSIS	A		ARC	AIC	AT	AR	AI	ASL	ASH	AAL	AAH		AE
CONDUCTIVITY	C		CRC	CIC	CT	CR			CSH		CAL		CE
DENSITY (SG)	D		DRC			DR	DI						DE
FLOW	F		FRC	FIC		FR		FSL	FSH	FAL	FAH	FG	FE
HAND	H	HS											
LEVEL	L		LRC	LIC	LT	LR	LI	LSL	LSH	LAL	LAH	LG	LE
MOISTURE	M		MRC	MIC	MT	MR	MI		MSH		MAH		ME
PRESSURE	P		PRC	PIC	PT	PR	PI	PSL	PSH	PAL	PAH		PE
PUSH BUTTON		PB											
SPEED	S		SRC	SIC	ST	SR	SI	SSL	SSH	SAL	SAH	SG	SE
TEMPERATURE (5)	T		TRC	TIC	TT	TR	TI	TSL	TSH	TAL	TAH		TE
POSITION	Z		ZRC	ZIC	ZT	ZR	ZI					ZG	ZE
MISCELLANEOUS	X		XRC	XIC	XT	XR	XI						XE

FOOTNOTES TO ABOVE COMBINATIONS:

1. THE ABOVE IDENTIFICATION PREFIXES ARE TO BE FOLLOWED BY THE NUMERICAL LOOP NUMBER PORTION OF THE NUMBER.
2. COMBINATION DEVICES WILL COMBINE PREFIXES SUCH AS [illegible]
3. MODIFIERS (IN PLACE OF [illegible]):

O/C	OPEN/CLOSE
OSC	OPEN/AUTO/CLOSE
S/S	START/STOP
R/S	RUN/STOP (RUN PERMITTED FROM CONTROL ROOM)
H/A	HAND/OFF/AUTOMATIC
JOG	JOG
RESET	RESET
H/O	HAND/OFF
OA	OFF/AUTOMATIC
SI	SELECTOR SWITCH (FOR MULTIPOINT INSTRUMENTATION)
H/L	HIGH/LOW SPEED SELECTOR
FOR/REV	FORWARD/REVERSE
A/O/C	AUTO/OPEN/CLOSE
A/M	AUTO/MANUAL

4. ESD MEANS EMERGENCY SHUT DOWN.
5. XXXX FURNISHED BY VENDOR WITH ASSOCIATED EQUIPMENT

SPECIAL PREFIXES	TYPE
EVV	ELECTRIC SOLENOID VALVE (AND ASSOCIATED COMPONENTS)
FFC	FLOW RATIO CONTROL
FQF	FLOW TOTALIZER
KC	TIMER FUNCTION
RO	RESTRICTION ORIFICE
XA	ALARM
XC	MISCELLANEOUS CONTROLLER

INSTRUMENT IDENTIFICATION NUMBER BREAKDOWN

PSV — 1 — 103 — A

- SUFFIX (ALPHA FOR DUPLICATE INSTRUMENTS, NUMERIC FOR LOOP NUMBERS)
- LOOP NUMBER
- TRAIN NUMBER (OPTIONAL)
- PREFIX (NOTE 1)

NOTES

1. ALL PREFIXES MUST BE SELECTED FROM THE MATRIX INSTRUMENT IDENTIFICATION PREFIXES ELSEWHERE ON THIS PAGE OR FROM THE LIST OF SPECIAL PREFIXES ABOVE.
2. NUMBER OF INSTRUMENT SHALL BE [illegible] SUFFIX CHARACTER [illegible] NOT RELATE TO EQUIPMENT TAGS.

Halliburton NUS CORPORATION

KEYWORDS	DESCRIPTION	BY	DATE
	DESIGNED	WCH	3/21/95
	DRAWN	CMF	3/22/95
	CHECKED	VS	3/31/95
	APPROVED		
SUBCONTRACTOR / ROOM/AREA / GRID COORD/CDL NO	SUBMITTED / APPROVED AEP / APPROVED DOE		
SCALE NONE			

U.S. DEPARTMENT OF ENERGY

ROCKY FLATS OFFICE — GOLDEN, COLORADO

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE, GOLDEN, COLORADO

ACCELERATED POND SLUDGE PROCESSING CONTRACT NO. 22547 GC/S13 CONCEPTUAL DESIGN LEGEND — PROCESS AND P & I DIA

SIZE D | DRAWING NUMBER [illegible] | ISSUE | SHEET

AUTOCAD REL 12 GENERATED
NO MANUAL CHANGES ALLOWED

VALVE SYMBOLS

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- BALL VALVE 3 WAY
- PLUG VALVE
- CHECK VALVE
- PINCH VALVE
- BUTTERFLY VALVE
- SLIDE GATE VALVE
- SLIDE GATE VALVE (DRY MATERIALS)

PIPING SYMBOLS

- BLIND FLANGE
- LINE SIZE CHANGE SEE PIPING SPEC FOR TYPE OF FITTING
- STARTUP STRAINER
- SPECIALTY ITEM (STRAINERS, TRAPS, ETC.) 1 = QUICK DISCONNECT HOSE COUPLINGS 2 = START-UP STRAINERS 3 = SIGHT GLASS 4 = VISUAL INSPECTION PORT 5 = ELUTRIATING SLEEVE
- SPOOL PIECE (SS)

LINE SYMBOLS

- MAJOR PROCESS LINES
- SECONDARY PROCESS AND/OR UTILITY
- PIPING WITH SECONDARY CONTAINMENT
- ELECTRONIC OR ELECTRICAL SIGNAL LINES
- DISTRIBUTED CONTROL SYSTEM LINK
- VENDOR PACKAGE UNITS/MODULES PERMANENT PIPING
- LINE NUMBER SEE PIPING SPEC FOR WELD SPECIFICATION
- FLEXIBLE HOSE

CROSS REFERENCE SYMBOLS

DESCRIPTION
SOURCE OR DESTINATION
D309-XXXX

FLOW IN OR EXIT ANOTHER DRAWING

VISCEL ANCES SYMBOLS

- VISCEL CONDITION
- QUICK DISCONNECT

EQUIPMENT SYMBOLS

- SUBMERGED PUMP
- MOTOR
- VACUUM PUMP
- FILTER UNIT
- MAN LIFT
- REACTIVE DYE ACCIDENT PUMP
- CENTRIFUGAL PUMP
- ROTARY FEED VALVE
- WEIGH BELT FEEDER
- TANK MIXER
- SCREW FEEDER
- SCREEN
- EXHAUST BLOWER

INDICATES CLOSED DRY

PROCESS TANK

INDICATES HEATER JACKET

PIPING LINE NUMBER

EXAMPLE LINE NUMBER

XX - AA - XXX - AAX - XXX - A

- NORMAL LINE SIZE
- LINE SERVICE SYMBOL
- SEQUENCE NO.
- PIPING MATERIAL CLASS
- PIPING INSULATION CLASS (OMITTED WHEN INSULATION NOT REQUIRED)
- HEAT TRACING TYPE (OMITTED WHEN HEAT TRACING NOT REQUIRED)

LINE SERVICE SYMBOL

- PLA = PLANT AIR
- CP = CONTAINMENT PURGE
- CWS = CHILLED WATER SUPPLY
- DD = DUST DEFLECTION
- SG = SEWER, GRAVITY (DRAIN TO OWNER'S SYSTEM)
- SP = SEWER, PNEUMATIC (PUMPED)
- SW = SANITARY WATER
- PW = PROCESS WATER
- HW = HIGH PRESS WATER
- RW = RAW WATER
- WF = FLUSH WATER
- MC = MIXED CEMENT
- FS = FERROUS SULFATE (NOT USED)
- BR = BRINE

SEQUENCE NO.

000 THRU 999

PIPING MATERIAL CLASS

FIRST DIGIT - FLANGE AND PRESSURE RATING SYSTEM
- 3 = ANSI CLASS 150
- 6 = ANSI CLASS 300

SECOND DIGIT - MATERIALS OF CONSTRUCTION
- A = CARBON STEEL (UNLESS OTHERWISE)
- B = HIGH DENSITY POLYETHYLENE
- Z = FLEXIBLE HOSE

THIRD DIGIT - SEQUENCE NUMBER

FOR HDPE PIPING
- DR7 = SDR 7
- DR9 = SDR 9
- DR11 = SDR 11
- DR17 = SDR 17

FOR RUBBER HOSE
- RZ1 = 2" RUBBER PRESSURE HOSE (150 PSIG PER 3301)
- RZ2 = 4" RUBBER SUCTION HOSE (25" Hg PER 3299)
- RZ3 = RUBBER LINED FIRE HOSE (PER 3300)
- RZ4 = FLEXIBLE DUCT HOSE

PIPING INSULATION CLASS

FIRST DIGIT - INSULATION MATERIAL SYMBOL
- 2 = CALCIUM SILICATE
- 5 = FIBERGLASS

SECOND DIGIT - INSULATION SERVICE SYMBOL
- 2 = HEAT CONSERVATION
- 3 = PERSONNEL PROTECTION

THIRD DIGIT - THICKNESS OF INSULATION (INCHES)
REFERENCED SPECIFICATION

HEAT TRACING SYMBOL

E = ELECTRICAL

VALVE IDENTIFICATION

XX-XXXX

- VALVE SIZE
- SEQUENCE

IDENTIFICATION OF VALVES NOT LISTED IN SPECS

GLOBE VALVES	LINE	SIZE
V8025	P3	6"
V8116	DP4, DP7	6", 10", 4"
V8015	P30	4", 3", 6"
V8050	DP1	10"

SLIDE GATE VALVES	LINE	SIZE
V8025	P3	6"
V8010	USED IN SLUDGE	
V8015	USED IN PNEUMATIC DAP	4"

MISC. ABBREVIATIONS

- CD = CLEAN OUT
- CSC = CAR SEAL CLOSED
- CSO = CAR SEAL OPEN
- CWP = CHAIN WHEEL OPERATED
- FC = FAIL CLOSE
- FL = FAIL LAST POSITION
- FO = FAIL OPEN
- FP = FULL PORT
- NC = NORMALLY CLOSED
- NF = NORMALLY NO FLOW
- NO = NORMALLY OPEN
- RTD = RESISTANCE TEMPERATURE DETECTOR
- SC = SAMPLE CONNECTION
- SS = STRAINER SHELL (SPOOL)
- SU = STEAM OUT (NOT USED)
- TC = THERMOCOUPLE
- T/T = TANGENT TO TANGENT
- US = UNDERSERVICE
- VB = VORTEX BREAKER
- (V) = VENDOR FURNISHED WITH ASSOCIATED EQUIPMENT

KEYWORDS

NO.	DESCRIPTION	BY	DATE
1			
2			
3			
4			
5			

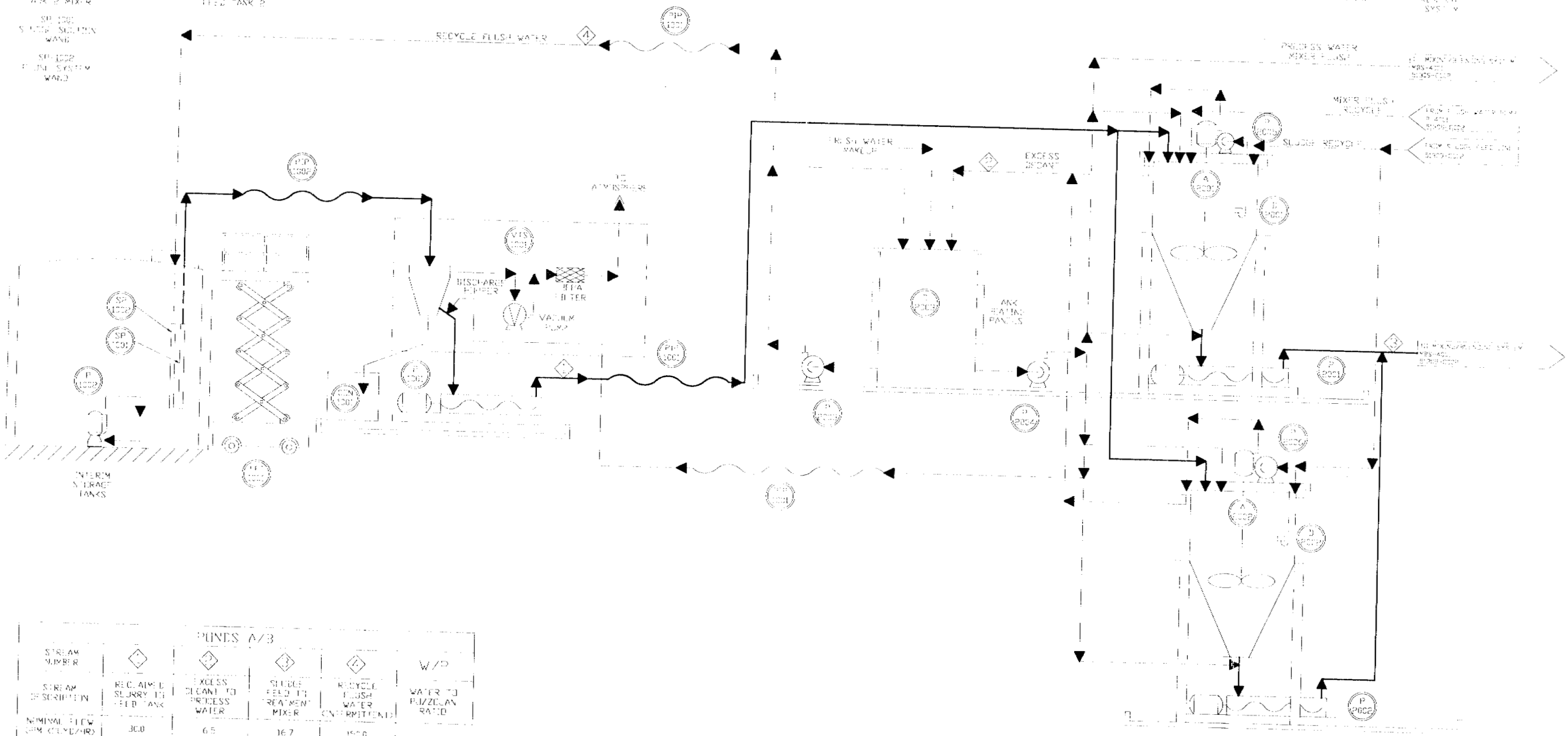
DESIGNED WCH 3/21/95
DRAWN SMF 3/22/95
CHECKED MS 3/31/95
APPROVED

Halliburton NUS CORPORATION

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO
ASSOCIATED FACILITIES PROCESS CONTROL SYSTEM P&ID'S
CONTROL SYSTEM P&ID'S
LEGEND PROCESS AND P & I DIA

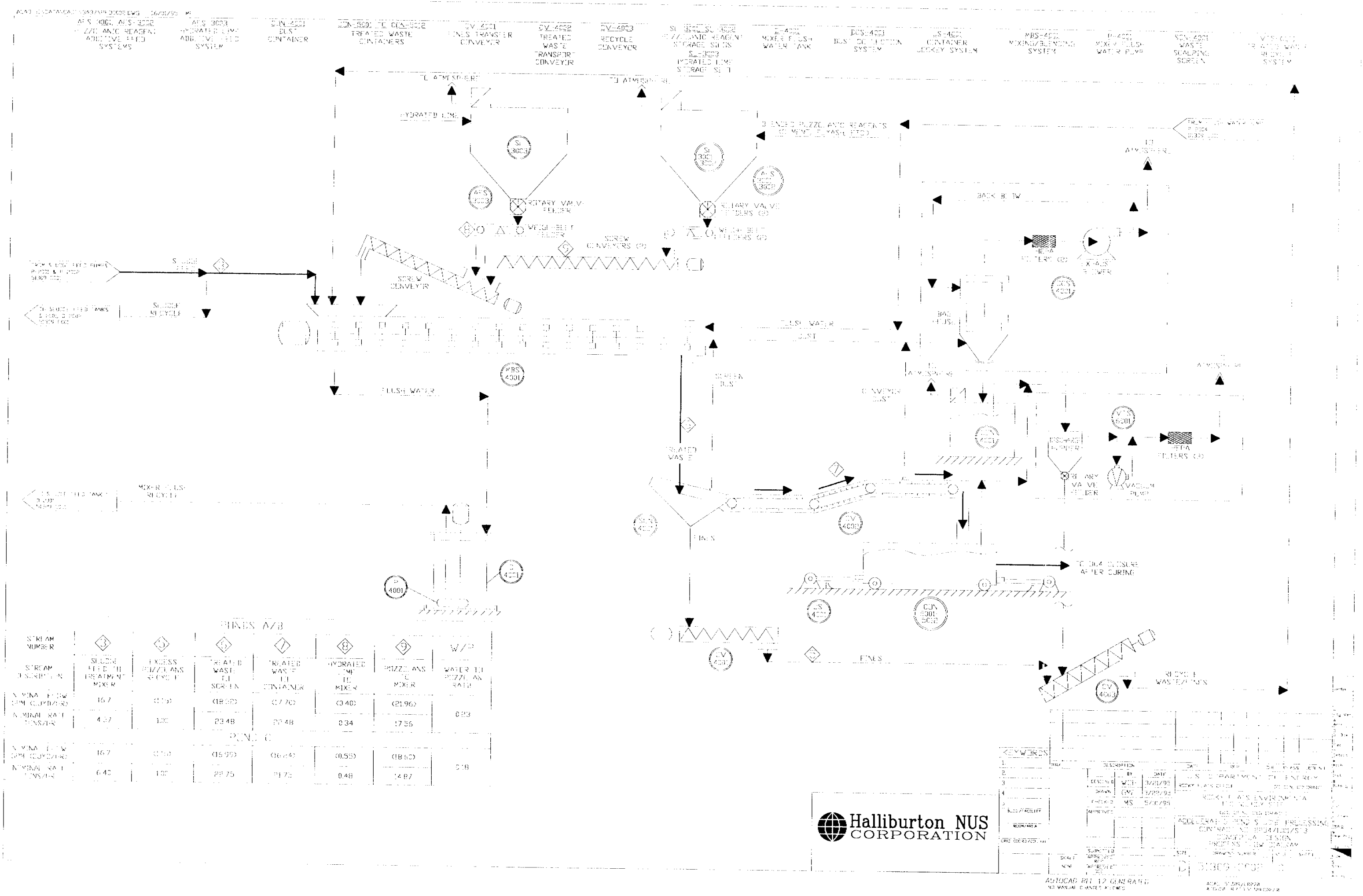
SIZE D
SCALE AS NOTED
DRAWING NUMBER 01209 0X04
SHEET

AUTOCAD RELEASE 12 GENERATED
NO MANUAL CHANGES ALLOWED



STREAM NUMBER	1	2	3	4	W/D
STREAM DESCRIPTION	RECLAIMED SLURRY TO FEED TANK	EXCESS DECANT TO PROCESS WATER	SLUDGE FEED TO TREATMENT MIXER	RECYCLE FLUSH WATER (INTERMITTENT)	WATER TO PUZZOLAN RATIO
PUMPS A/B					
NOMINAL FLOW (GPM (CENTRIFUGE))	30.0	6.5	16.7	150.0	
NOMINAL RATE (GAL/HR)	8.06	1.65	4.57	38.24	0.23
PUMP C					
NOMINAL FLOW (GPM (CENTRIFUGE))	39.0	6.5	16.7	150.0	
NOMINAL RATE (GAL/HR)	11.43	2.44	6.46	38.24	0.18

Halliburton NUS CORPORATION

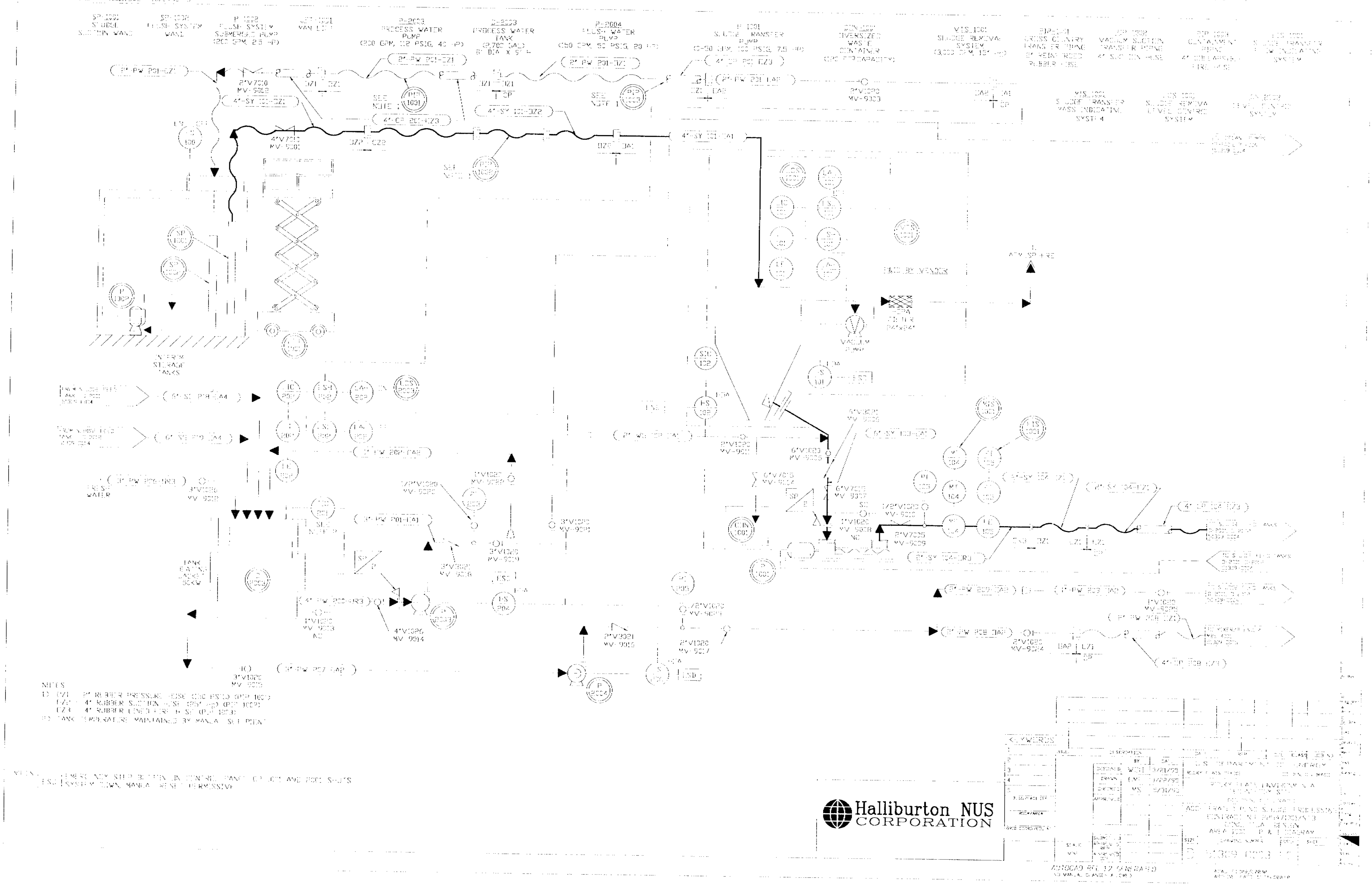


FINES A/B

STREAM NUMBER	5	6	1	7	8	9	W/C
STREAM DESCRIPTION	SLUDGE FEED TO TREATMENT MIXER	EXCESS PUZZOLANS RECYCLE	TREATED WASTE TO SCREEN	TREATED WASTE TO CONTAINER	HYDRATED LIME TO MIXER	PUZZOLANS TO MIXER	WATER TO PUZZOLAN RATIO
NOMINAL FLOW GPM (GPD/DRUM)	16.7	(7.5)	(18.52)	(7.70)	(0.46)	(21.96)	
NOMINAL SOLIDS TPH/DR	4.67	1.00	23.48	23.48	0.34	17.56	0.23

FINES C

NOMINAL FLOW GPM (GPD/DRUM)	16.7	(7.5)	(19.95)	(8.64)	(0.55)	(18.60)	
NOMINAL SOLIDS TPH/DR	6.42	1.00	22.75	21.75	0.48	14.87	0.18


P-2003
PROCESS WATER
PUMP
(200 GPM, 112 PSIG, 40 HP)
P-2004
FLUSH WATER
PUMP
(150 GPM, 50 PSIG, 20 HP)
INTERIM
STORAGE
TANKS
FRESH
WATER
E&C BY VENDOR
VACUUM
PUMP
NOTES
Halliburton NUS
CORPORATION
U.S. DEPARTMENT OF ENERGY
AUTOCAD REL 12 GENERATED

LCS 2001
LEVEL CONTROL
SYSTEM

LCS 2002
LEVEL CONTROL
SYSTEM

P-2001
SLUDGE FEED
PUMP 1
(0-40 GPM, 50 PSIG, 5 HP)

P-2002
SLUDGE FEED
PUMP 2
(0-40 GPM, 50 PSIG, 5 HP)

P-2003
DECANT PUMP
(90 GPM, 85 PSIG, 15 HP)

P-2004
DECANT PUMP
(90 GPM, 85 PSIG, 15 HP)

A-2001
SLUDGE FEED
TANK 1 MIXER
(7.5 HP)

A-2002
SLUDGE FEED
TANK 2 MIXER
(7.5 HP)

T-2001
SLUDGE FEED
TANK 1
(6,000 GAL)
10' DIA X 4'-0" SWD
45° CONE

T-2002
SLUDGE FEED
TANK 2
(6,000 GAL)
10' DIA X 4'-0" SWD
45° CONE

2"-SY-104-GZ1

2"-SY-104-GR3

2"-SY-104-GZ1

2"-SY-105-LA3

2"VBC20
MV-9025

2"VBC26
MV-9027

2"-SY-201-GZ1

2"-SY-201-GR3

4"-GP-201-LR3

2"-SY-201-GR3

2"-PW-201-LA2

2"VBC22
MV-9026

2"-SY-240-GZ1

2"-SY-240-LR3

2"VBC21
MV-9042

4"VBC31
MV-9037

2"VBC23
MV-9028

2"-PW-201-LA2

4"VBC32
MV-9038

2"VBC24
MV-9043

2"-SY-240-GZ1

2"-SY-240-LR3

4"VBC33
MV-9039

4"VBC25
MV-9040

4"-SY-214-GA1

4"VBC34
MV-9041

4"VBC35
MV-9036

6"-SG-218-LA4

4"VBC36
MV-9033

1/2"VBC37
MV-9031

4"VBC38
MV-9034

4"-SY-213-GA1

1/2"VBC39
MV-9032

2"VBC28
MV-9035

2"-SY-215-LR3

2"-SY-215-GZ1

4"-GP-215-GZ1

6"-SG-218-LA4

2"-PW-205-LA2

6"-SG-215-LA4

NOTES:

1. SIZE 2" RUBBER PRESSURE HOSE, GSC ESTD. P/N 1003
   SIZE 4" RUBBER SUCTION HOSE, GSC ESTD. P/N 1004
   SIZE 4" RUBBER LINED FLEXIBLE HOSE, GSC P/N 1003
2. EMERGENCY STABILIZATION ON-SITE WORK PLAN - OU #2001, SHEET 5 OF 5
   SYSTEM DRAWING MANUAL, SECTION VI

KEYWORDS

DESCRIPTION

BY	DATE
MDC	3/21/95
JVE	3/22/95
MS	3/24/95

Halliburton NUS CORPORATION

AUTOCAD REL 12 (UNLIMITED)
NO MANUAL DRAWING ALLOWED

AFS-3000 PUZZLANIC REAGENT STORAGE SILO 1 (2'0"Øx24'0"SS, 100 YD³)

AFS-3001 PUZZLANIC REAGENT ADDITIVE FEED SYSTEM 1 (6' 0" TPH)

AFS-3002 HYDRATED LIME ADDITIVE FEED SYSTEM (6' 0" TPH)

SILO-3003 HYDRATED LIME STORAGE SILO (20'0"x14'0"SS, 40 YD³)

SILO-3002 PUZZLANIC REAGENT STORAGE SILO 2 (20'0" x 24'SS, 100 YD³)

AFS-3004 PUZZLANIC REAGENT ADDITIVE FEED SYSTEM 2 (6' 0" TPH)

CDS-3001 SLUDGE FEED FLOW CONTROL SYSTEM

MSS-3001 SLUDGE FEED MASS CONTROL SYSTEM

SILO-3001 STORAGE SILO LEVEL CONTROL SYSTEM

SILO-3003 STORAGE SILO LEVEL CONTROL SYSTEM NO. 1

SILO-3004 STORAGE SILO LEVEL CONTROL SYSTEM NO. 2

FROM TRUCK UNLOADER PNEUMATIC TRANSPORT AND DELIVERY SYSTEM

PUZZLANIC REAGENT

4"V1005 MV-9044

TO ATMOSPHERE

HYDRATED LIME

4"V1006 MV-9046

TO ATMOSPHERE

PUZZLANIC REAGENT

4"V1007 MV-9048

TO ATMOSPHERE

FROM TRUCK UNLOADER PNEUMATIC TRANSPORT AND DELIVERY SYSTEM

SLUDGE FEED PUMP AND PIPING SYSTEM

VIBRATORY FEEDER

ROTARY FEED VALVE (12"x12")

WEIGH BELT FEEDER (24"Wx27'-0")

SCREW CONVEYOR (PART OF AFS-3002) (9"Dx40'-0")

SCREW CONVEYOR (PART OF AFS-3002) (9"Dx40'-0")

SCREW CONVEYOR (PART OF AFS-3003) (9"Dx30'-0", 30 TPH)

MIX 3: PUZZLANIC AND LIME

SLUDGE FEED

8"V7005 MV-9051

8"V7005 MV-9050

NOTES:

1) WATER/PUZZLAN (W/P) RATIO (NOM. MANUAL SET)
2) LIME INPUT AS FUNCTION OF FEED (MANUAL SET)
3) WATER/PUZZLAN (W/P) RATIO (NOM. MANUAL SET)
4) DZ1 = 8" RUBBER PRESSURE HOSE (150 PSIG RWP, 225 PSIG BP)
   DZ2 = 4" RUBBER SUCTION HOSE (150 PSIG RWP, 450 PSIG BP)
   DZ3 = 4" RUBBER DISCHARGE HOSE (150 PSIG RWP, 450 PSIG BP)
5) ESD = EMERGENCY SHUTDOWN CONTROL PANEL (CP-3001, CP-3002, & CP-3003 SOLIDS SYSTEM SHUTDOWN MANUAL RESET PUSHBUTTON)

Halliburton NUS CORPORATION

AS-BUILT REVISIONS

NO.	DESCRIPTION	BY	DATE
1			
2			
3			
4			
5			

DESIGNED WCH 3/20/95
DRAWN CME 3/28/95
DETAILED MS 7/31/95
APPROVED

U.S. DEPARTMENT OF ENERGY

RICKY FLATS ENVIRONMENTAL RESTORATION PROJECT

ROCKY FLATS, COLORADO

AGGLOMERATED SLUDGE PROCESSING

CONTRACT NO. DE-AC04-92RF69115

PROCESS FLOW DIAGRAM

AREA 3000

SIZE D

DRAWING NUMBER 51309 0000

AUTOCAD RELEASE 12 GENERATED

AS MANUAL CHANGES ARE MADE

P-4002
MIXER FLUSH
WATER PUMP
(250 GPM
@ 75 PSIG, 25 HP)

D-4001
MIXER FLUSH
WATER TANK
(525 GAL)
5'D X 5'H

MBS 4001
MIXING/BLENDING
SYSTEM
(21'Wx8'L, 0-30 TPH)

SW-4001
FINES WASHER
CONVEYOR
(C-40, 24"W, 5 HP)
9'D X 40'L

SCN-4001
TREATED WASTE
SCALPING SCREEN
(2MM OPENINGS)
4'W X 8'L

SW-4002
TREATED WASTE
TRANSPORT CONVEYOR
(C-40, 24"W, 5 HP)
(30'Wx50'L)

LLS-4001
MIXER FLUSH LEVEL
CONTROL SYSTEM

MIXED PEZZI ANS AND FINES

SLURRY FEED

FLUSH WATER

FINES

TREATED WASTE

SCREENED TREATED WASTE

TREATED WASTE CONTAINER

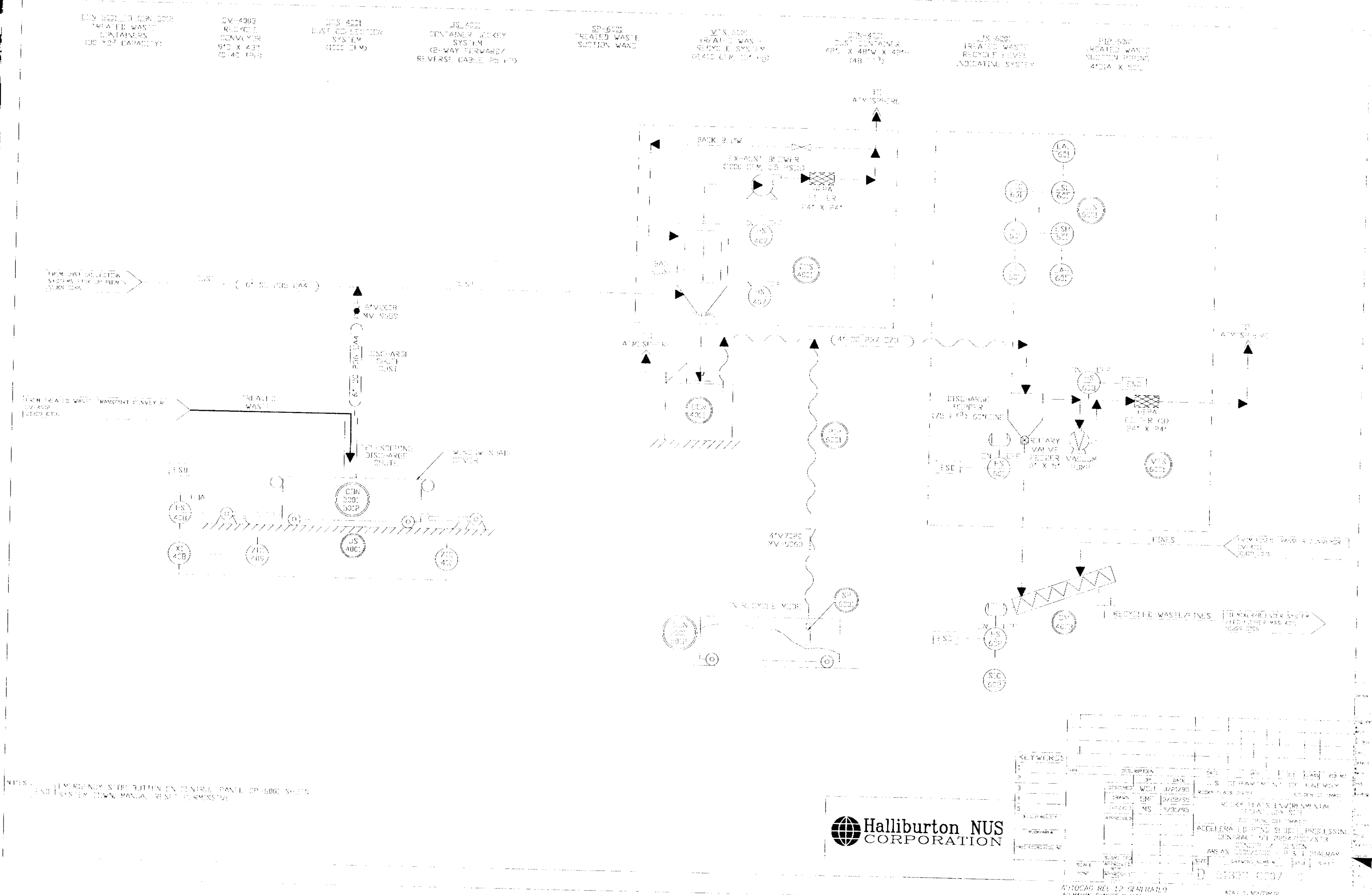
NOTES:
1) 1Z1 - 6" RUBBER PRESSURE HOSE (150 PSIG) (P/N 3001)
1Z2 - 4" RUBBER SUCTION HOSE (50' LG) (P/N 3002)
1Z3 - 4" RUBBER DISCHARGE HOSE (P/N 3003)

EMERGENCY STOP BUTTON ENGINEERING TAG (EP-4001 SHEET 5)
ESB SYSTEM DOWN MANUAL RESET PERMISSIVE

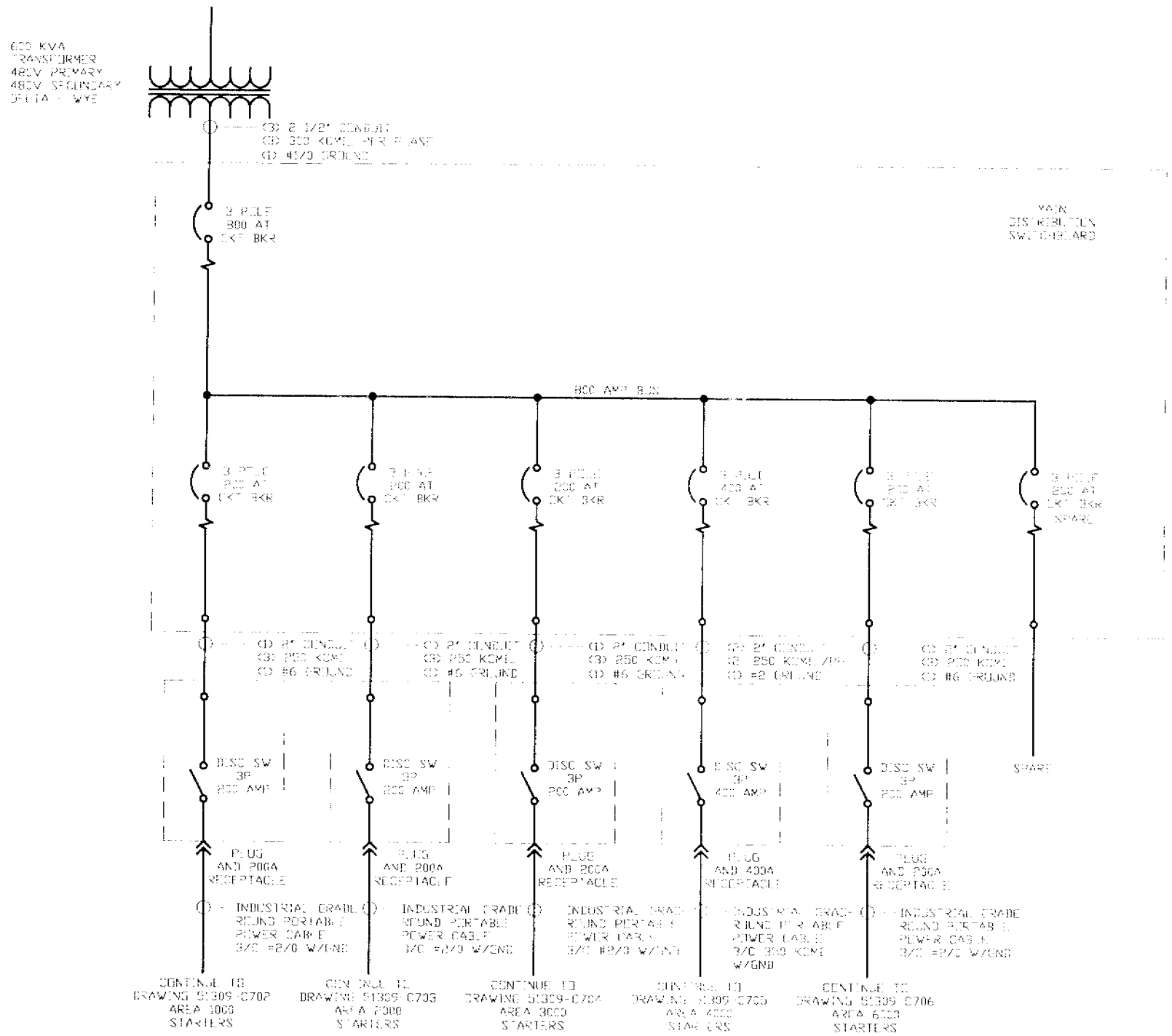
Halliburton NUS CORPORATION

KEYWORDS

AUTOCAD RELEASE 12 GENERATED



CON 5001 THRU CON 5012
TREATED WASTE CONTAINERS
(30 YD3 CAPACITY)
CV-4003
RECYCLE CONVEYOR
JS-4001
CONTAINER JOCKEY SYSTEM
(2-WAY FORWARD/ REVERSE CABLE)
SP-6001
TREATED WASTE SUCTION WAND
DCN-4001
DUST CONTAINER
JS-6001
TREATED WASTE RECYCLE LEVEL INDICATING SYSTEM
TO ATMOSPHERE
BACK BLOW
EXHAUST BLOWER
HEPA FILTER
24" X 24"
TREATED WASTE
DISCHARGE CHUTE
DISCHARGE HOPPER
ROTARY VALVE FEEDER
VACUUM PUMP
FINES
RECYCLED WASTE/FINES
NOTES:
Halliburton NUS CORPORATION
KEYWORDS
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
ACCELERATED POND SLUDGE PROCESSING
AREAS
DRAWING NUMBER
3/21/95
3/22/95
3/31/95



Halliburton NUS CORPORATION

KEYWORDS

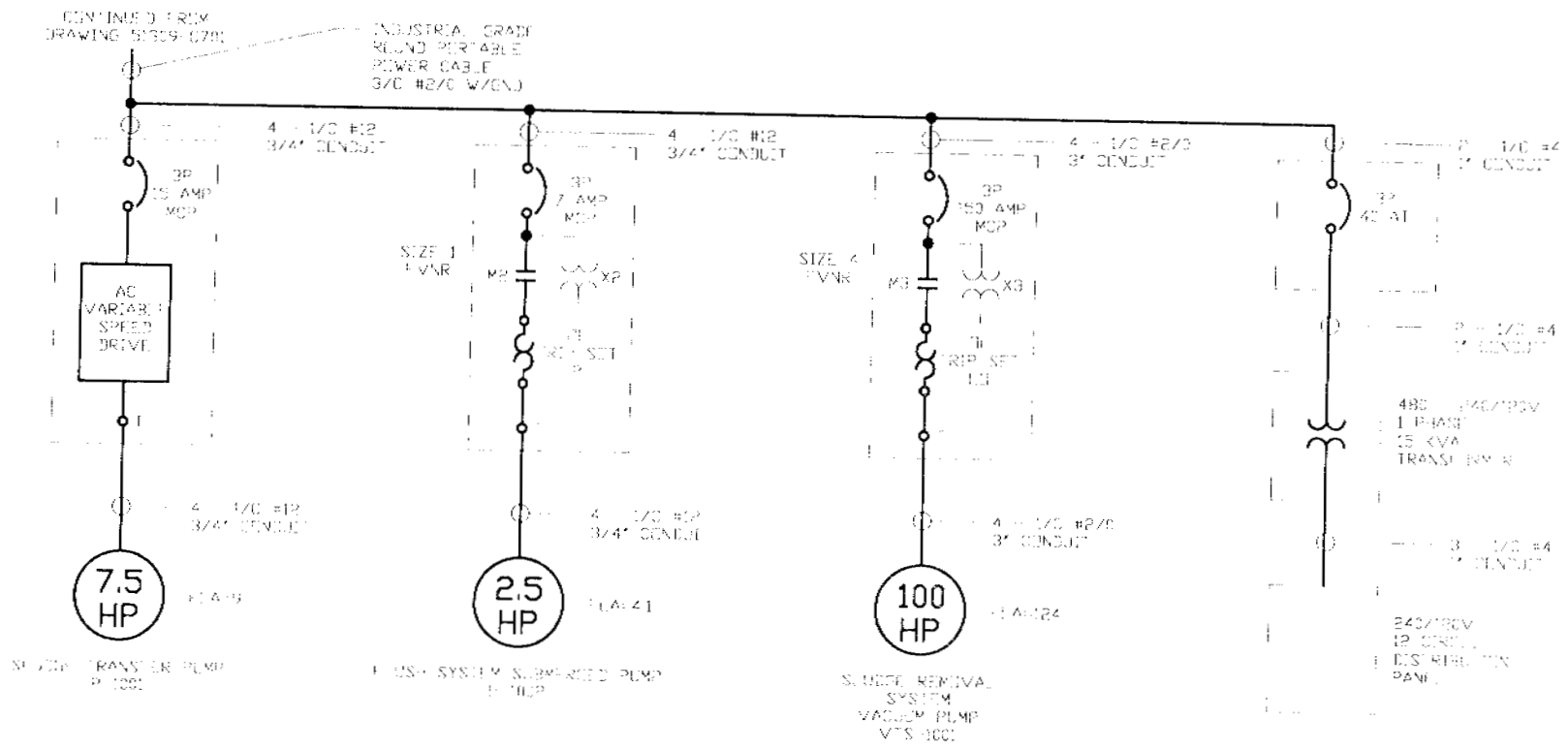
NO.	DESCRIPTION	BY	DATE
1.			
2.			
3.			
4.			
5.			

DESIGNED	WDH	3/20/95
DRAWN	JME	3/20/95
CHECKED	MS	3/30/95
APPROVED		

U.S. DEPARTMENT OF ENERGY
RICKY FLATS ENVIRONMENTAL
RESTORATION PROJECT
ACCELERATED PEAK SLUDGE PROCESSING
CONTRACT NO. DE-AC34-92SF19513
ENGINEERING DESIGN
ELEC SINGLE LINE DIAGRAM MAIN DISTR

SIZE D | DRAWING NUMBER S1309-G701 | REV 0

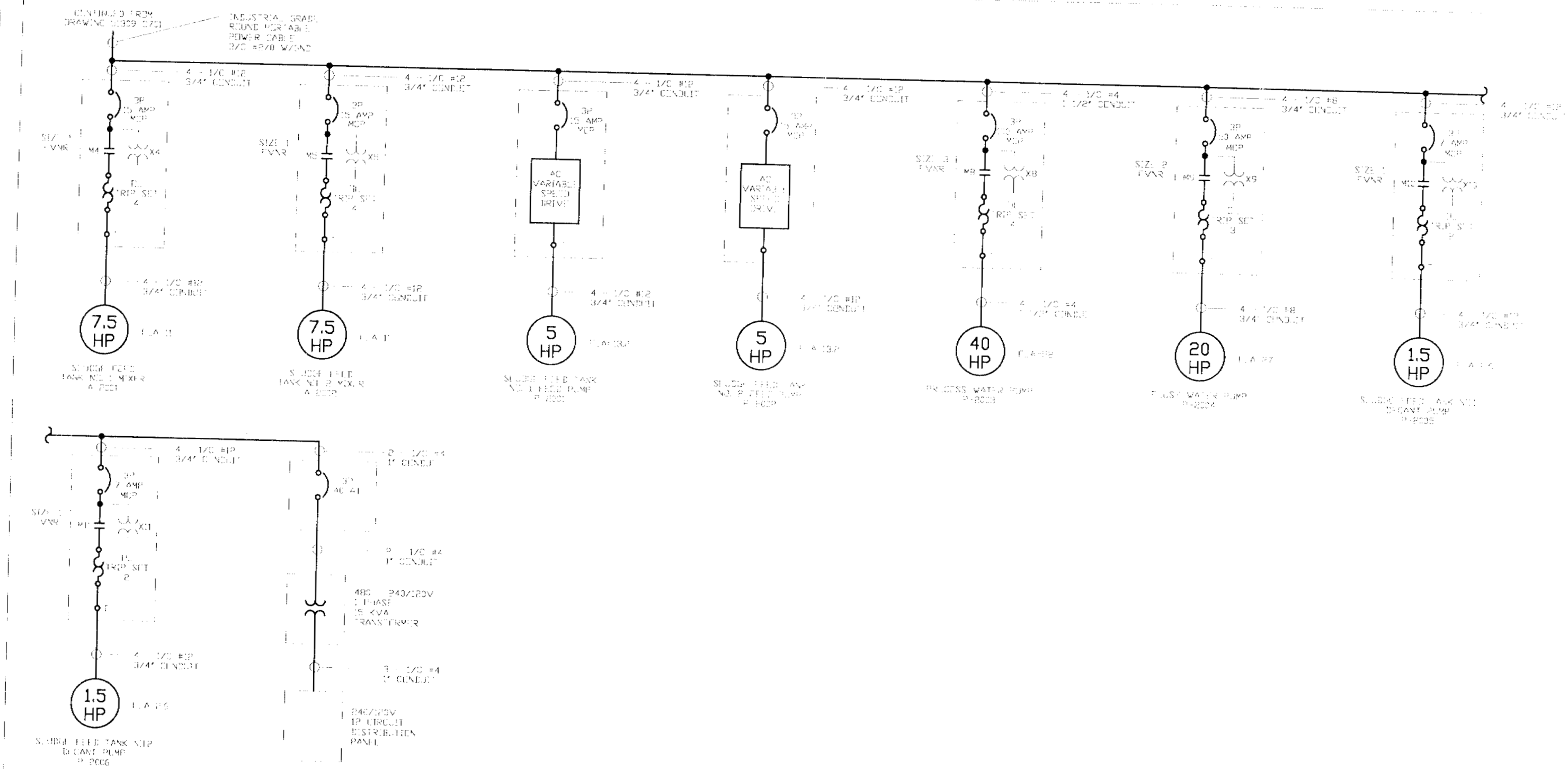
AUTOCAD REL 12 GENERATED
NO MANUAL CHANGES ALLOWED



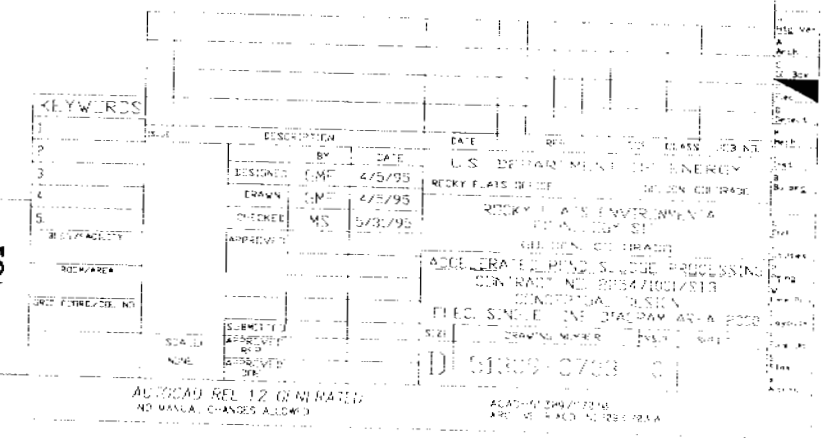
Halliburton NUS CORPORATION

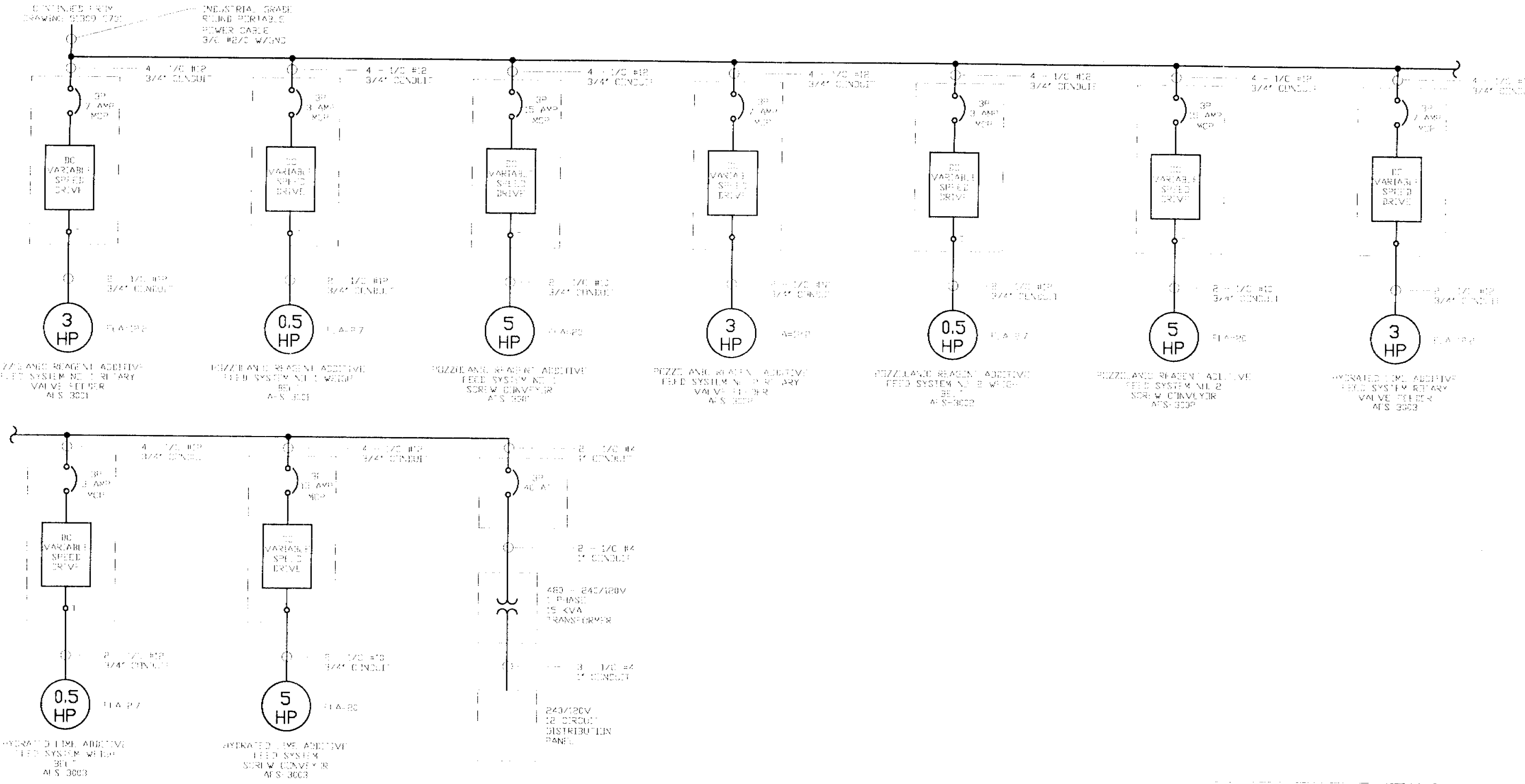
KEYWORDS

AUTOCAD REL 12 ON BAND
NO MANUAL CHANGES ALLOWED



Halliburton NUS CORPORATION

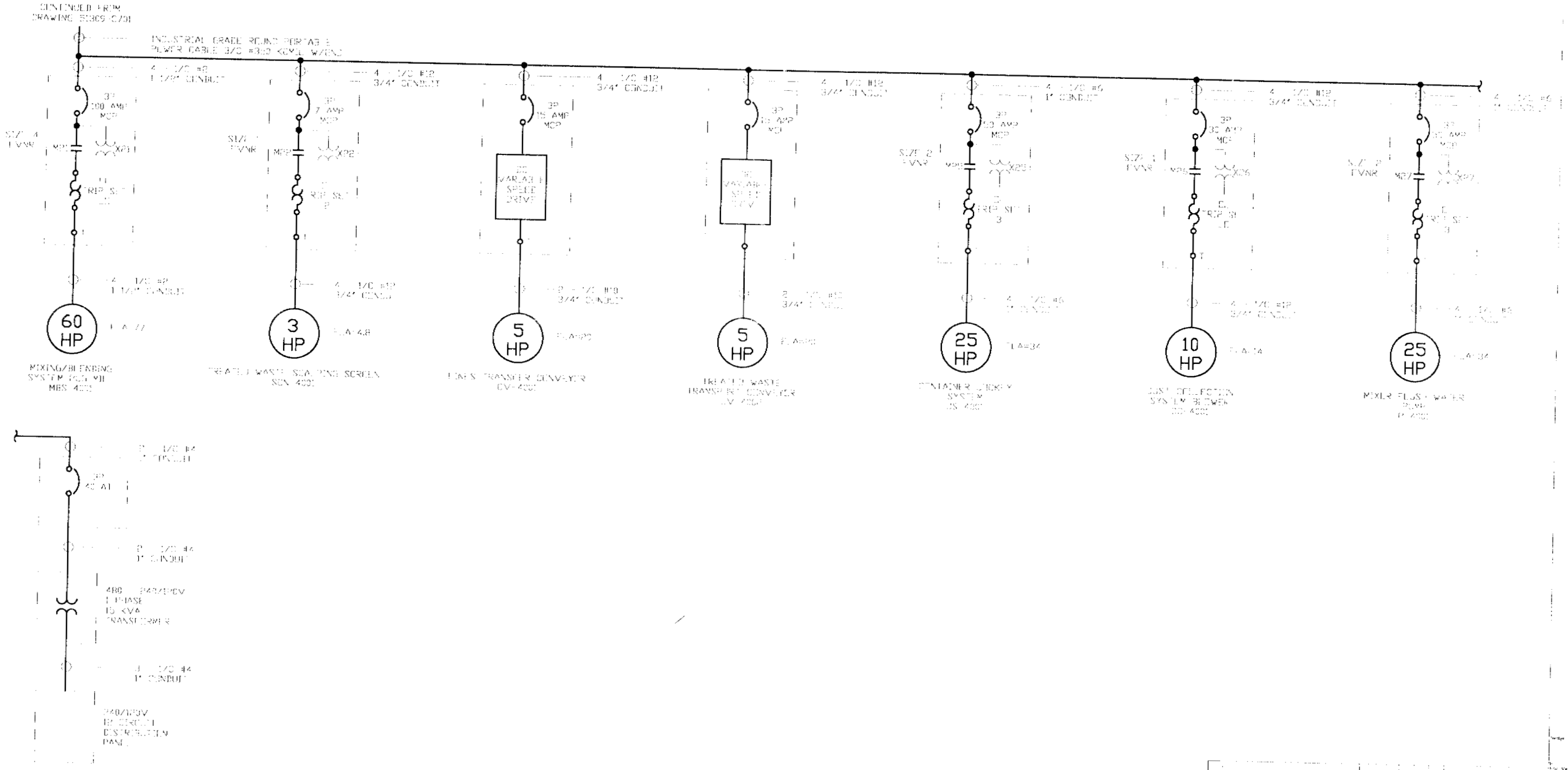


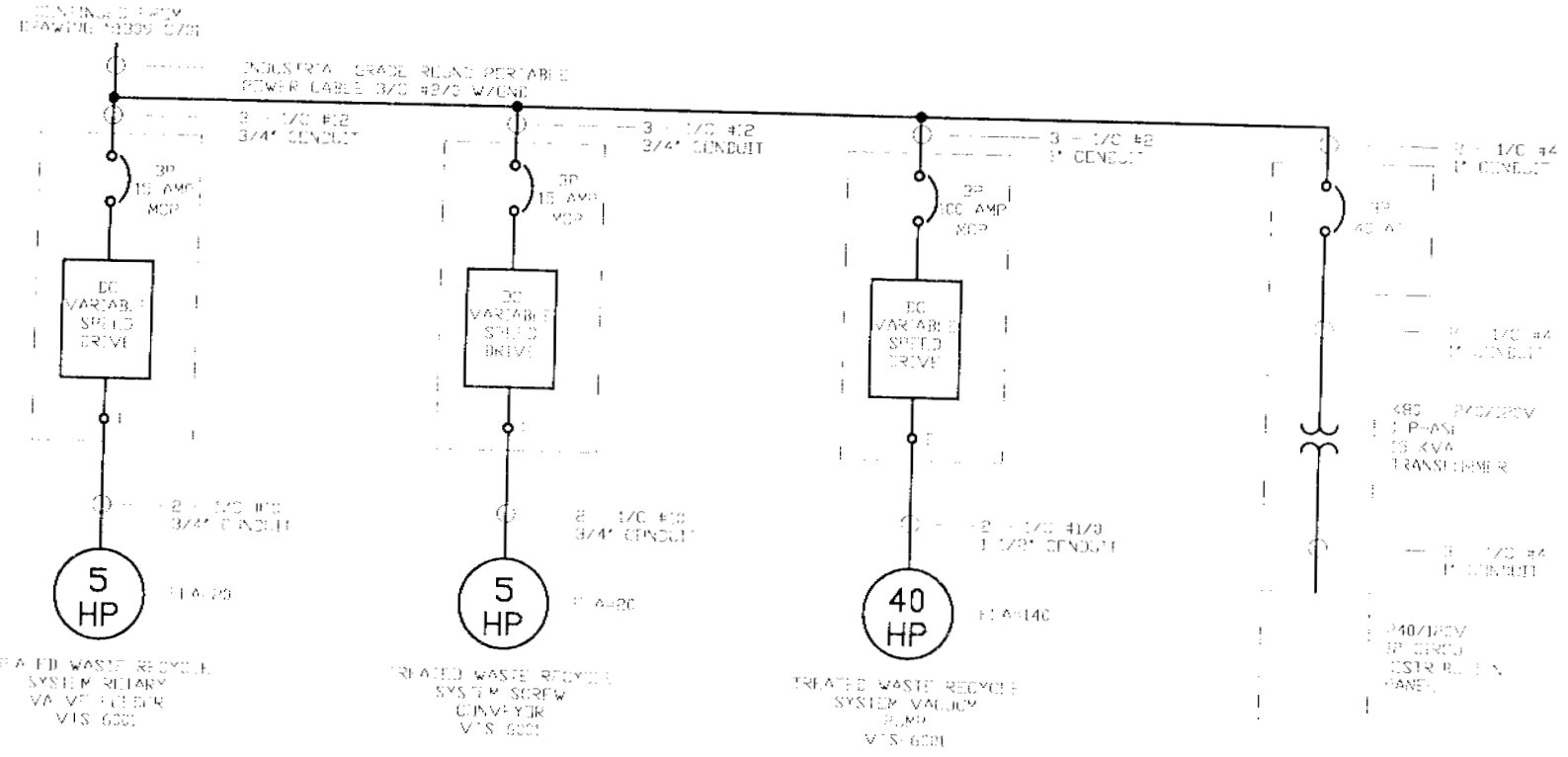


KEYWORDS

Halliburton NUS CORPORATION

AL POWER RIVER GENERATING


EXTENDED FROM
DRAWING S3309 C/01
INDUSTRIAL GRADE ROUND PORTABLE
POWER CABLE 3/C #10 AWG
4 - 1/C #8
1 1/2" CONDUIT
3P
200 AMP
MCP
SIZE 4
FVNR
MCP
OL
TRIP SET
4 - 1/C #12
3/4" CONDUIT
60
HP
FLA 77
MIXING/BLENDING
SYSTEM POD VIII
MBS 4001
3P
7 AMP
MCP
SIZE 1
FVNR
TRIP SET
3
4 - 1/C #12
3/4" CONDUIT
3
HP
FLA 4.8
TREATED WASTE SCALPING SCREEN
SCR 4001
3P
15 AMP
MCP
VFD
VARIABLE
SPEED
DRIVE
4 - 1/C #12
3/4" CONDUIT
5
HP
FLA 9.0
FINES TRANSFER CONVEYOR
CV-4001
3P
15 AMP
MCP
VFD
VARIABLE
SPEED
DRIVE
2 - 1/C #12
3/4" CONDUIT
5
HP
FLA 9.0
TREATED WASTE
TRANSFER CONVEYOR
CV 4002
3P
60 AMP
MCP
SIZE 2
FVNR
TRIP SET
3
4 - 1/C #6
1" CONDUIT
25
HP
FLA 34
CONTAINER LOADOUT
SYSTEM
DS 4001
3P
30 AMP
MCP
SIZE 1
FVNR
TRIP SET
10
HP
FLA 14
DUST COLLECTION
SYSTEM BLOWER
DC 4001
3P
60 AMP
MCP
SIZE 2
FVNR
TRIP SET
3
4 - 1/C #6
1" CONDUIT
25
HP
FLA 34
MIXER FLUSH WATER
PUMP
P 4001
3P
45 AT
3 - 1/C #4
1" CONDUIT
480 - 240/120V
1 PHASE
15 KVA
TRANSFORMER
3 - 1/C #4
1" CONDUIT
240/120V
1Ø 3 WIRE
DISTRIBUTION
PANEL
KEYWORDS
DESIGNED WCH 3/22/95
DRAWN CWE 3/22/95
CHECKED MS 5/23/95
APPROVED
Halliburton NUS
CORPORATION
AUTOCAD Rel 12 ON WINDOWS
NO MANUAL CHANGES ALLOWED



Halliburton NUS
CORPORATION

CONTINUED FROM DRAWING 51309-C701

INDUSTRIAL GRADE ROUND PORTABLE POWER CABLE 3/C #2/0 W/GND

4 - 1/C #12 3/4" CONDUIT

SIZE 1 FVNR
3P 15 AMP MCP
M4 X4
OL TRIP SET 4
T
4 - 1/C #12 3/4" CONDUIT
7.5 HP FLA=11
SLUDGE FEED TANK NO. 1 MIXER A-2001

4 - 1/C #12 3/4" CONDUIT

SIZE 1 FVNR
3P 15 AMP MCP
M5 X5
OL TRIP SET 4
T
4 - 1/C #12 3/4" CONDUIT
7.5 HP FLA=11
SLUDGE FEED TANK NO. 2 MIXER A-2002

4 - 1/C #12 3/4" CONDUIT

3P 15 AMP MCP
AC VARIABLE SPEED DRIVE
T
4 - 1/C #12 3/4" CONDUIT
5 HP FLA=13.2
SLUDGE FEED TANK NO. 1 FEED PUMP P-2001

4 - 1/C #12 3/4" CONDUIT

3P 15 AMP MCP
AC VARIABLE SPEED DRIVE
T
4 - 1/C #12 3/4" CONDUIT
5 HP FLA=13.2
SLUDGE FEED TANK NO. 2 FEED PUMP P-2002

4 - 1/C #4 1 1/2" CONDUIT

SIZE 3 FVNR
3P 100 AMP MCP
M8 X8
OL TRIP SET 4
T
4 - 1/C #4 1 1/2" CONDUIT
40 HP FLA=52
PROCESS WATER PUMP P-2003

4 - 1/C #8 3/4" CONDUIT

SIZE 2 FVNR
3P 50 AMP MCP
M9 X9
OL TRIP SET 3
T
4 - 1/C #8 3/4" CONDUIT
20 HP FLA=27
FLUSH WATER PUMP P-2004

4 - 1/C #12 3/4" CONDUIT

SIZE 1 FVNR
3P 7 AMP MCP
M10 X10
OL TRIP SET 2
T
4 - 1/C #12 3/4" CONDUIT
1.5 HP FLA=2.6
SLUDGE FEED TANK NO.1 DECANT PUMP P-2005

4 - 1/C #12 3/4" CONDUIT

SIZE 1 FVNR
3P 7 AMP MCP
M11 X11
OL TRIP SET 2
T
4 - 1/C #12 3/4" CONDUIT
1.5 HP FLA=2.6
SLUDGE FEED TANK NO.2 DECANT PUMP P-2006

2 - 1/C #4 1" CONDUIT

3P 40 AT
2 - 1/C #4 1" CONDUIT
480 - 240/120V 1 PHASE 15 KVA TRANSFORMER
3 - 1/C #4 1" CONDUIT
240/120V 12 CIRCUIT DISTRIBUTION PANEL

KEYWORDS
1.
2.
3.
4.
5.
BLDG/FACILITY
ROOM/AREA
GRID COORD/COL NO

ISSUE	DESCRIPTION	DATE	RFP	DOE	CLASS	JOB NO.

	BY	DATE
DESIGNED	GMF	4/5/95
DRAWN	GMF	4/5/95
CHECKED	MS	5/31/95
APPROVED		
SUBMITTED		
APPROVED RFP		
APPROVED DOE		

SCALE: NONE

Halliburton NUS CORPORATION

U.S. DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE GOLDEN, COLORADO

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO

ACCELERATED POND SLUDGE PROCESSING
CONTRACT NO. 22547100I/ST3
CONCEPTUAL DESIGN
ELEC. SINGLE LINE DIAGRAM-AREA 2000

SIZE	DRAWING NUMBER	ISSUE	SHEET
D	51309-C703	0	

AUTOCAD REL 12 GENERATED
NO MANUAL CHANGES ALLOWED

ACAD=51309/C703B
ARCHIVE=R.ACD. 51309.C703.0